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UGUST

Your Fishing Tackle—Page 317

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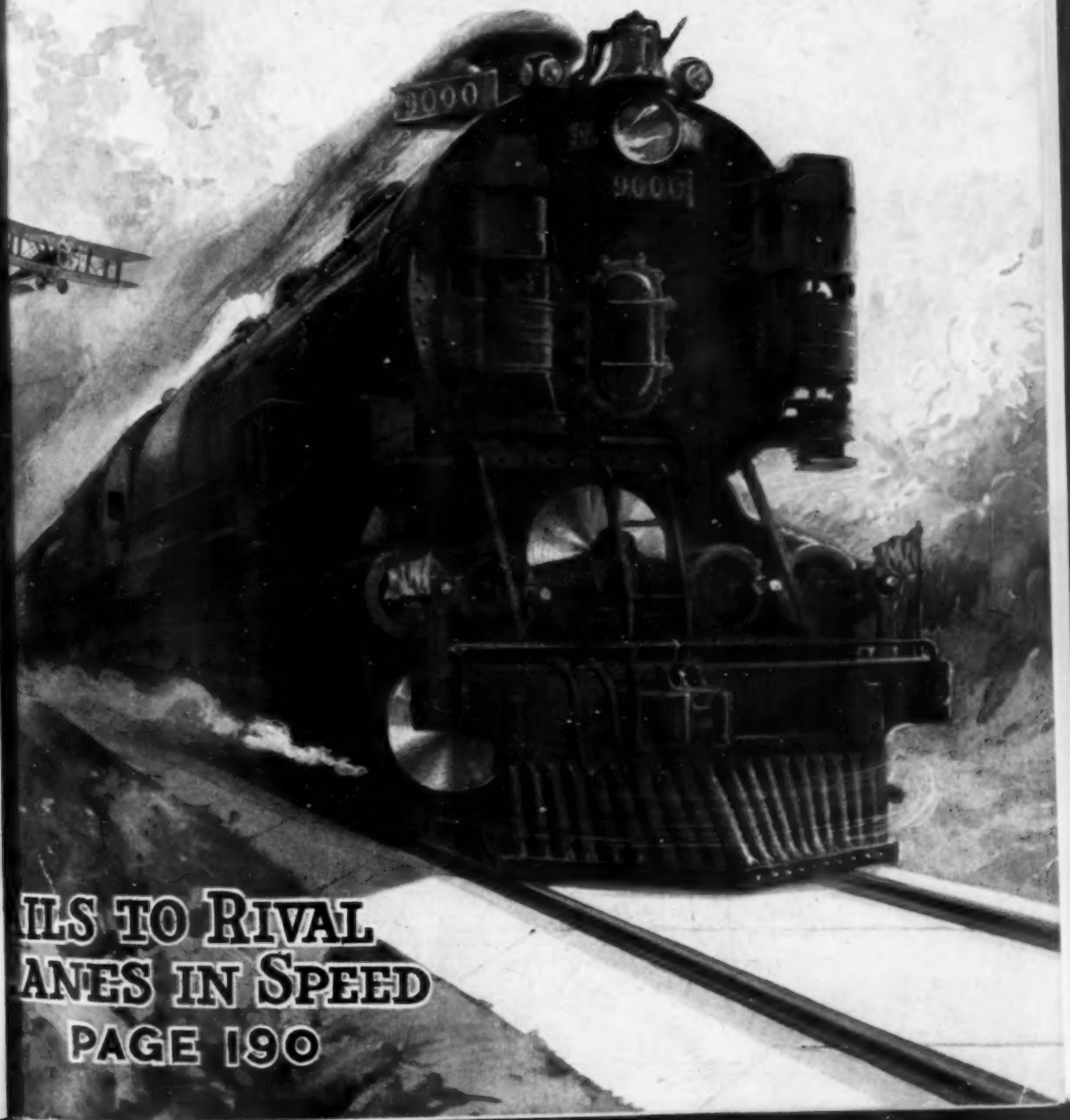

ILS TO RIVAL
ANES IN SPEED

PAGE 190

It Pays to Buy a Better Saw!

HERE are three popular ATKINS Saws — for the carpenter, home-worker or junior mechanic:

No. 400 hand saw, preferred by master carpenters everywhere—the finest saw in the world.

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Popular Mechanics Magazine
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Vol. 46 AUGUST, 1926 No. 2

The Mighty Monoplane "Josephine Ford" in Flight; First Aircraft to the Top of the World, Its Place in History Is Secure

There is the North Pole!

How the Heavens Direct Man to the Roof of the World with the Aid of Sun Compass and Other Novel Instruments

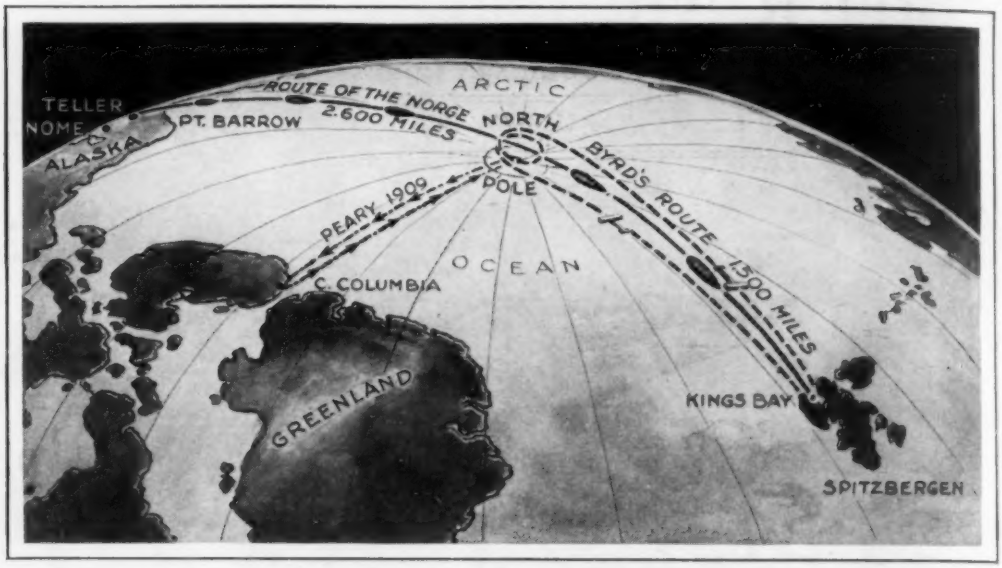
By CORLEY McDARMENT

"RIGHT here is the north pole!" How can anyone say this as a positive fact, especially if he is whizzing through the air at a hundred miles an hour at the time? Within one week, an airplane and an airship have sailed over the desert of frozen ice men call the Arctic, and, without a lake, a river or a piece of land to guide them, they went directly to the pole.

To accomplish such a feat is a tribute to the ingenuity of man. One wonderful thing about it is that a way has been found to cheat the ice floes by sailing on the wind, and the other is to know when the exact top of the world has been reached. But man alone could never tell when he has flown to the north pole; he must depend upon the landmarks of the heavens which have been set by a mightier hand.

If the sky should be obscured, the north pole could never be found except with a tape line. No position on the earth can be fixed unless some celestial body, whose habits are known, can be seen. In regions south of the Arctic, where the sun rises at points in the east which can be predetermined by tables, it is easy to locate a position at sunrise. But beyond the Arctic circle, where during the summer the sun never sets, but swings low and red around the horizon for the whole twenty-four hours, the problem has never been easy until recently.

Time does not exist at the north pole. That is, a person cannot put his finger on the right hour and make it mean anything. By merely taking a few steps a man may walk around twenty-four hours of time as it is counted far down the meridians, or he may step from one day on one side of the world to another. He can gain or lose whole days merely by walking a few steps. At the north pole, the pole star is very nearly directly overhead. Around this star revolve the Great Dipper and Cassiopeia. Also, the sun in summer swings around this star once in twenty-four hours. But the exact position of the north pole cannot be found by traveling up to a place where the pole star is di-



Amundsen and Byrd Traveled in a Few Hours by Air Distances That Took Peary Painful Months with Dogs and Sleds; the Three Pathways of the Polar Pioneers

rectly overhead. The means of determining this position must be by the sun.

The latest developments in aerial navigation which enabled Lieut. Comm. Byrd and Pilot Bennett, and, a week later, Amundsen, Lincoln Ellsworth and Col. Nobile, to determine quickly and accurately their position at all times during their flight to the pole were the Bumstead sun compass, the bubble sextant and Littlehale's method of finding geographic location.

With these instruments it was unnecessary to use the mariner's compass, which is of little value at these high altitudes on account of magnetic variation throwing it off as much as thirty degrees, or the old-style sextants depending on the finding of a horizon, which is frequently obscured from an aircraft. Also, optical illusions such as mirages distort the horizon and prevent accurate readings with the ordinary sextant.

To eliminate the necessity for a clear horizon, a new kind of sextant has a horizon all its own. This instrument combines the regular sextant with a simple bubble level. A tiny electric bulb is used to locate the bubble at night.

A watch must be used with the sextant, which, by sighting on the sea or an artificial horizon, will show the angle of the celestial body to the horizon; in other words, show how high in the sky the sun has risen. By using a watch and a table showing the position of the earth, the exact location may be calculated quickly. In order to check on the position of the pole, the aerial navigator needs only to fly a little distance beyond the spot for his readings to be off, and they will be off at every place except at the pole itself. The navigator knows exactly what his readings should be when he reaches the pole and he can read a bearing to within ten miles.

The sun compass, which came into prominence with the flights, is really not much more than an ordinary sun dial. The face of the instrument is divided into twenty-four spaces corresponding to the hours of the day, and a single hand, acting as a pointer, moves by clockwork around the dial. Beneath this clock face is a compass card with the directions. The pointing hand of this sun compass is unique. It does not stop at the pivot, but extends a little beyond and there it is bent directly upward. It is like a clock with a hand extending from 12:00 to 6:00 o'clock bent straight up near the pivot. The compass card and clock dial are set in such a way that the navigator can interpret the shadow of this upright hand, or post, and the instrument is lined up with the true direction as predetermined

Bearing Plate That Shows Effect of Wind in Changing Plane's Course; Sights Are Taken on Stationary Objects

Lieut. Comm. Byrd Wearing Special Leather Helmet and Mask; at 2,000 Feet, It Was Eight Degrees above Zero near the Pole

Byrd Using the Special Sextant from the Plane's Observation Seat; This Instrument Had a Horizon All Its Own, Making the Navigator Independent of the Natural Line

Sun Compass; Tiny Post at Base of Pointer Casts Guiding Shadow

Point Hour Hand at Sun; Halfway between That and Twelve O'clock Will Be Approximate North

by celestial observation. The shadow of the post can be made to fall directly upon the pointing hand when a true course is held. This is possible because the hand moves around the dial following the sun.

When Comm. Byrd desired to travel a due north course, he set the compass dial for north and then so maneuvered his plane that the shadow thrown by the post would be exactly superimposed upon the hand of the clock. The sun compass is small enough to be held in the hand and is very easy to use when the clock has been accurately set to sun time and the sun is unobscured enough to cast a shadow.

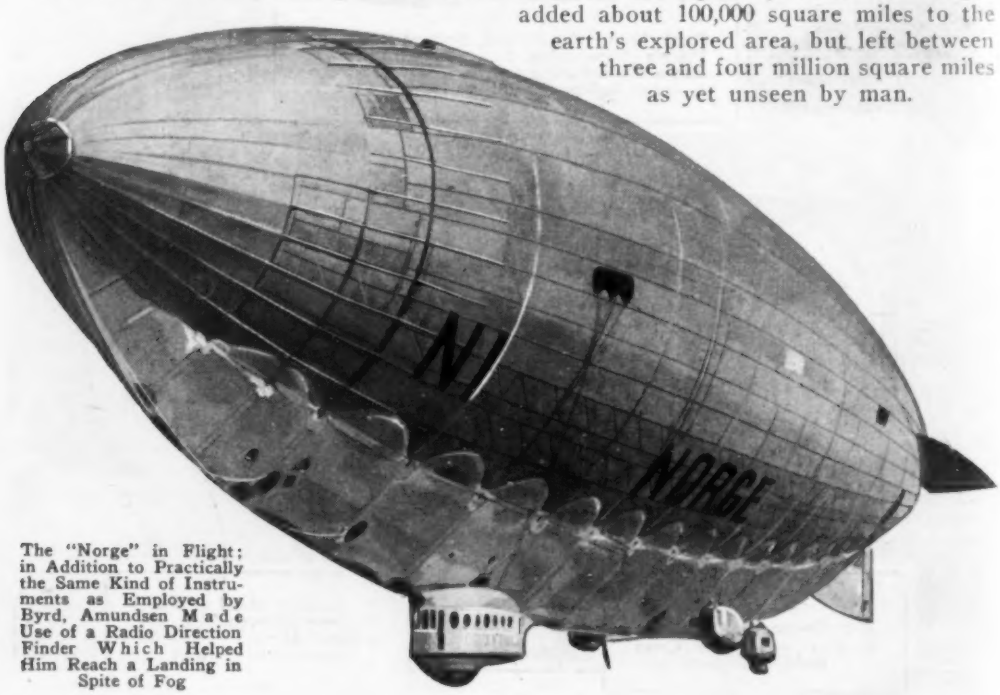
Another instrument which aviators use is the bearing plate, or drift indicator. With it Comm. Byrd was able to determine the influence upon his airplane of the wind which would drive it off its course unless allowance were made for such drift. It is a small glass plate, located in the bottom of the cockpit and covered with cross wires, through which a sight can be taken on some stationary object below. It also gives quite accurately the speed the plane makes over the ground, which, on account of the wind, may differ from the air speed.

One of the most interesting methods of locating the position of the north pole is Littlehale's formula. This is a simplified system of using the nautical almanac, which contains the apparent position of the sun, moon and principal stars in the heavens for all hours of the day. The almanac is made up ahead of time, by a few years, because the future positions of the celestial bodies can be calculated easily.

On his trip Comm. Byrd had, in addition to his dashboard clock, two Greenwich-time chronometers, wrist watch and another small watch. As extreme cold sometimes causes variations in timepieces, it was necessary to provide means for checking the hours. Also there were two sun compasses.

In calculating the course, Comm. Byrd took drift observations every three or four minutes. He was sighting so constantly on the bright, sunlit snow beneath the plane that his right eye began to show symptoms of snow blindness and he had to shift to his left.

Flying at a height of about 2,000 feet, a temperature of eight degrees above zero was encountered. From the plane, the ice-covered surface of the Arctic ocean could be seen for fifty miles in every direction. The trip of Byrd and the "Norge" added about 100,000 square miles to the earth's explored area, but left between three and four million square miles as yet unseen by man.



The "Norge" in Flight; in Addition to Practically the Same Kind of Instruments as Employed by Byrd, Amundsen Made Use of a Radio Direction Finder Which Helped Him Reach a Landing in Spite of Fog

WATCHES TO RUN BY RADIO, ENGINEER PREDICTS

Pocket watches which will be accurately synchronized, if not kept running, by impulses sent from a central radio station, are predicted by an eastern engineer. The timepieces will be like special receiving sets. They will have neither mainsprings nor batteries, and although static offers certain problems, it is believed that these difficulties can be overcome. The present use of radio in sending out time signals and the transmission of energy in small quantities by wireless are cited as indicating that the radio watch is not an impossibility.

To Commemorate the American Victory at Cantigny, the National Geographic Society Has Erected This Monument on the Battlefield; Two Panels Are Inscribed in French and English

SAILOR FASHIONS SHIP MODELS OF TURKEY BONE

Bones of Christmas turkeys were employed in fashioning replicas of two sailing vessels by the boatswain of a Pacific liner while on a voyage from South America to California. The ships are three-masted affairs and handsomely colored. The breastbone was used for the hulls and smaller bones for the masts, spars and other parts.

Boatswain Jack Taylor with Model Ships He Fashioned from Turkey Bones during Spare Time

FIRST U. S. WORLD-WAR VICTORY MARKED BY MONUMENT

At Cantigny, scene of America's first important victory in the World war, a monument has been erected by the National Geographic Society. Two panels bear dedicatory sentiments.

ANTITOXIN TO CURB MEASLES AND AID IN CURE

Discovery of a measles antitoxin which can be used both for preventive and curative control of an epidemic, recently has been announced by the American Medical association. Doctors N. S. Ferry and L. W. Fisher of Detroit, Mich., found the organism that causes measles. From the soluble toxin it produces, the antitoxin is derived in large quantities through the use of horse serum. A blood serum from convalescent measles patients has already been employed with some degree of success as a means of prevention.

HOW LIMIT OF HUMAN SPEED IS BEING MEASURED

Breathing Tests with Measuring Gauge, and Runners at the End of a Race; Insert, Charles Paddock's Strained Expression Shows Fatigue's Mark at Finish of a Swift Sprint

What fixes the limit of a runner's speed? Can better training, more gameness and keener competition produce constantly lower records or is there a point beyond which no athlete can go? According to Prof. A. V. Hill, an English authority, man's running ability is largely determined by his oxygen "borrowing power," that is, the ability of the muscles to draw on temporary substitutes within the body when the supply from the outside is insufficient during great effort.

Whether or not a runner will break a record depends chiefly on two factors, Prof. Hill declares, the degree to which he can overdraw his oxygen "account" and his maximum capacity for taking in oxygen during the race. He has found that man comes nearest his speed limit in the 100 and 220-yard dashes, but that lower records in the longer runs of 500 yards, three quarters of a mile and three miles are yet possible. An average running speed of six yards a second, he says, may be maintained for distances between five and ten miles. A woman's athletic ability is about sixty-seven per cent of that of a man of equal weight, Prof. Hill has estimated. He recognizes three different kinds of fatigue; that which results from violent strain for a short period, exhaustion resulting from more moderate but prolonged effort, and that due to wear and tear on the body as a whole.

VALLEY OF AMAZON IN RUBBER COULD SUPPLY WORLD

Sufficient rubber to supply the entire world could be grown in the Amazon valley, according to James R. Weir of the department of agriculture, providing suit-

able measures were taken to protect the crop against diseases. Trees there, it has been found, are subject to attacks from fungi which reduce their growth and starve them to death.

LATEST BALL FOR WATER SPORT HAS WINGED AIR SEAL

A rubber ball which can be deflated and carried in the pocket is one of the latest devices for use in water and land games. Simple rules for both amateurs and professionals have been written by Tom Robinson, swimming coach at Northwestern university, where the ball was first introduced. The sphere is made of extra-strong rubber and has a patented cap. It is blown up by the lungs, a hard rubber plug is inserted in the filling tube which is then pushed into the ball with the finger, the tube turning wrong side out in the process and forming an air-tight seal. The disappearing filling tube is the unique feature. The ball comes in three sizes, a small one for water baseball, a play ball which can be blown up to twelve inches in diameter, and a still larger size, capable of inflation to more than fifteen inches across. Deflated, the ball rolls up and occupies little more space than a folded handkerchief will do.

Coach Tom Robinson, Famous Swimming Teacher, Throwing the New Collapsible Rubber Ball, and Inserts Showing Its Disappearing Plug

Mrs. Lillian Cram of Portland, Oreg., at Her Easel on Which She Is Fashioning a Picture in Rags

PICTURES PORTRAYED IN RAGS BY WOMAN ARTIST

Brightly colored pictures are fashioned from hundreds of tiny pieces of cloth by a western woman. She works on an easel, the fragments being pasted in place and cut to fit with scissors. By careful choice of designs and shades, she achieves artistic and unusual results.

STORKS FORCE POWER COMPANY TO BUILD THEM PERCHES

To save a 60,000-volt transmission line in Morocco from being wrecked by hordes of storks, the French company owning it has been forced to build special perches along the entire line from Casablanca to Rabat. The big birds discovered as soon as the line was built that the steel masts supporting the wires were ideally designed as supports for stork nests, giving much firmer foundations than a tree or a roof. The huge nests, however, interfered seriously with the insulation of the line. The special perches, and smooth shields over the masts on which the birds could not gain a footing, ended the trouble.

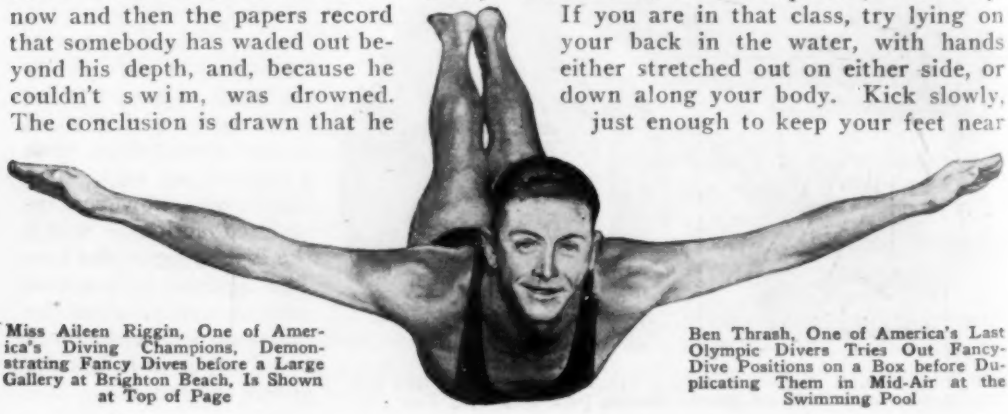
It's as Easy

SWIMMING is one of the easiest things a person can learn, once the fear of water has been mastered. It is as easy to swim as it is to walk; easier, in fact, because the water offers a soft couch and you can turn over, lie on your back and rest whenever you get tired.

It is almost impossible to drown, if you keep your head and don't become panic-stricken from fear of the water. Every now and then the papers record that somebody has waded out beyond his depth, and, because he couldn't swim, was drowned. The conclusion is drawn that he drowned because he could not swim, which is all wrong. He drowned because he lost his head.

To a lot of people that sounds like heresy, yet practically all adults, most girls, and quite a few boys can float in water, with mouth and nose well above the surface, without moving hand or foot, while anybody, with an occasional kick and a bit of paddling, can float indefinitely. The ability to float without kicking or paddling depends upon the body being slightly lighter than the volume of water it displaces. Tom Robinson, swimming coach at Northwestern university and swimming instructor to the children of an entire town, says that practically every girl is able to float motionless in the water. Not so many of the boys who come to college are able to do it, because they are lean and compact, with heavier tissue, but in later life, after they have put on a bit of fat, they can do it. The feet, it is true, will sink toward the bottom until the body is vertical in the water, but with the arms spread out on the surface, the head, and sometimes even the neck, will be above the water.

For those who haven't the necessary amount of fat, floating, with the aid of an occasional kick and paddle, comes easy. If you are in that class, try lying on your back in the water, with hands either stretched out on either side, or down along your body. Kick slowly, just enough to keep your feet near



Miss Aileen Riggin, One of America's Diving Champions, Demonstrating Fancy Dives before a Large Gallery at Brighton Beach, Is Shown at Top of Page

Ben Thrash, One of America's Last Olympic Divers Tries Out Fancy-Dive Positions on a Box before Duplicating Them in Mid-Air at the Swimming Pool

to SWIM as to WALK

Helen Wainwright, American Aquatic Queen for Four Years, in a Graceful Swan Dive

the surface, and wiggle your hands up and down at the wrist, moving them just enough to keep your face clear. You will soon find you can slow down to an almost imperceptible motion and still keep afloat.

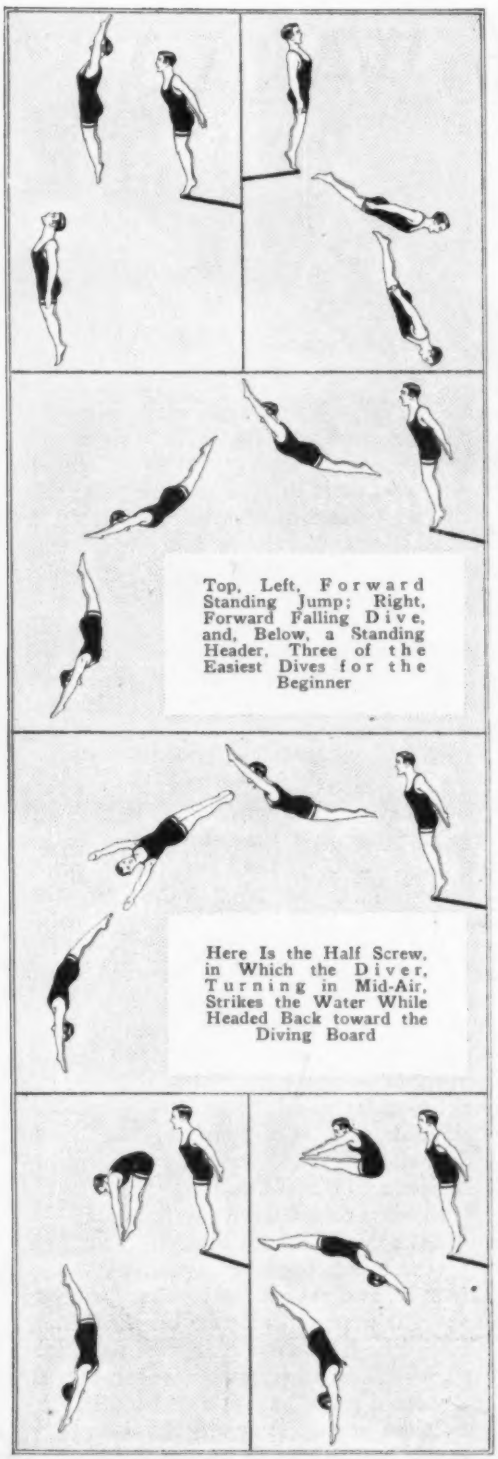
The main thing when learning to swim is to conquer the instinctive fear of the water. If you start by floating, and discover that you can lie on your back, for hours if necessary, most of the fear is gone. Nothing can happen to you in the water as long as you keep your wits about you. Even a cramp, feared by so many, is only painful, not dangerous. You don't need both legs or both arms to keep afloat, and if cramp temporarily puts you out of commission, the other three will see you through, if you don't lose your head.

Most swimming coaches start their pupils with some form of the simple dog paddle, the easiest stroke to master since it is the instinctive action of a new swimmer struggling to keep his head above water. It isn't a speed stroke, and it is accompanied by a lot of unnecessary splashing, but with a bit of practice it is easy to learn to co-ordinate the kick with the stroke and achieve a fair rate of progress through the water. The dog paddle, too, has the advantage of keeping the head well up, a benefit to the new swimmer who is still chary about sticking his nose beneath the surface, because he has not learned how to regulate his breathing.

From the dog paddle such coaches as Tom Robinson advance their beginners to a simple overhand stroke in which the swimmer lies partly on his side, with one cheek down in the water. If you are lying on the right side, with the right arm beneath you, it is drawn up along the side, the hand passes out beyond the head, as far as it will reach, and is then swept down and back, with palm extended. While the underneath arm is sweeping back in the stroke, the other is drawn up past the chin, extended to its limit, and swept down, back and slightly sideways. The two strokes thus alternate, accompanied by vigorous, but well-timed kicks.

From the overhand stroke the swimmer can progress to the breast stroke, or sailor's stroke as it is sometimes called, and here, for the first time, he begins to get his nose wet. Stand in water about breast-deep, place your hands together just beneath your chin, with the palms and the fingers touching, and then bend over and launch yourself forward, shoving your feet to the surface with a strong push. At the same time, keeping your hands together, extend them full length, turn them to bring the palms out and the backs together, and then sweep them sideways and back, accompanying the stroke with a shoving kick, made by drawing up the knees and then extending them. Carry the stroke through until the hands almost reach the hips, then draw the arms up, bring the hands together again just below your chin, and repeat the stroke. You can practice it first at home or on the beach.

While the hands are being brought forward the face will be under water, so you start with a good breath and hold it. As the stroke starts sweeping backward, it pulls the body forward and up, lifting the face so you can get a fresh breath on each stroke. It takes practice to learn to swim



Top, Left, Forward Standing Jump; Right, Forward Falling Dive, and, Below, a Standing Header, Three of the Easiest Dives for the Beginner

Here Is the Half Screw, in Which the Diver, Turning in Mid-Air, Strikes the Water While Headed Back toward the Diving Board

Plain Pike Dive, Left, and the Auerbach Pike Dive, at Right, as Prescribed by the Rules of the International Olympic Games

with your nose under water, holding your breath and timing your breathing with your swimming. The practice is necessary, though, before you can graduate into such speed strokes as the Australian crawl, the greatest of them all.

The crawl requires the same position as the breast stroke, but the arms, instead of working together, move separately, are lifted entirely out of the water while being brought forward, in order to reduce friction and drag, and breathing is accomplished by turning the head sideways during the stroke, until the nose clears the surface. The crawl stroke is very much like that of the under arm in the overhand stroke. As the body turns slightly to the side the under arm is brought back and down, while the other hand, which is at the hip after completing its stroke, is brought up by doubling the elbow above the water, raising the hand clear until it can swing forward to reach out for the next stroke. It starts that stroke just as the first hand completes one, and the body rolls to the other side, to enable the first elbow to clear the water while the hand is being brought forward to position.

There are numbers of good swimming strokes, but nothing faster than the crawl has been invented.

After a swimmer has mastered the breast stroke he can try swimming on his back for a change. The position is the same as for floating, but the arms, instead of paddling at the sides, are brought up past the head, extended full length, and then swept down and back, accompanying the stroke by a vigorous kick.

Plain diving is as easy to learn as swimming. The chief requirement is confidence and a cool head. Not everyone can learn to do the fancy dives, one, one and a half and double somersaults, jackknife or pike dives, or such things as head stands and borers, but anyone who has discovered how hard it is to drown himself can learn to do a graceful dive, even from a high board. The dives pictured here are from the official catalog of the 1920 Olympic games, at Antwerp, and show the form on which Olympic divers are judged. The upper three are simple dives, quickly mastered by anyone. The half screw, or borer, and the pikes require more practice and a higher diving board.

Johnny Weismuller, American Swimming Champion, Demonstrating Various Strokes; Left, Is the Simple Paddle for Beginners, and at the Right, Two Views Showing How the Arm Is Lifted in the Australian Crawl

The Breast, or Sailor's Stroke, at Left, Is Accompanied by the Scissors Kick, Which Imparts a Powerful Forward Thrust When It Is Properly Timed with the Arm Movements

The Back Stroke Comes Easy, Once the Trick of Floating Is Mastered, as Illustrated at the Right

The Side Stroke Follows the Beginner's Paddle, with the Body Turned Sideways and the Chin under Water

Here Is Another View of the Side Stroke, Which Lies Midway between the Simple Paddle and the Australian Crawl, the Greatest Speed Stroke of All

Sliding Down Leaning Steamer Hull on Its Pair of Skids, the Lifeboat Is Kept from Capsizing While Being Launched

PAIR OF SKIDS FOR LIFEBOAT PREVENTS UPSETTING

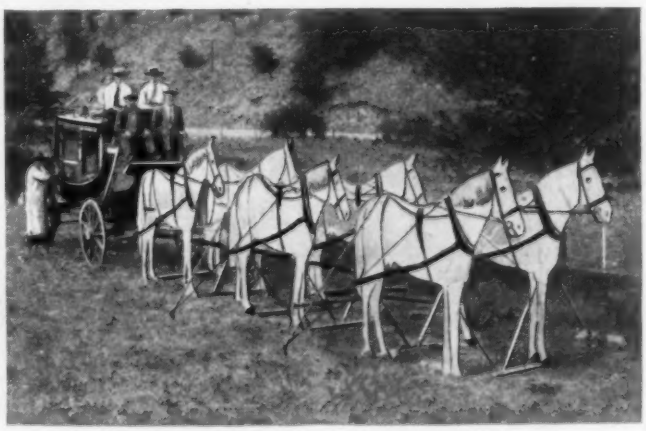
To keep lifeboats from tipping over while they are being lowered down the side of a vessel, a pair of skids, easily attached to the bottom, have been devised. The boat is little likely to catch and capsize while descending with this arrangement in place, as it keeps an upright position until it strikes the water.

DANGER POINTS OF YOUR BODY

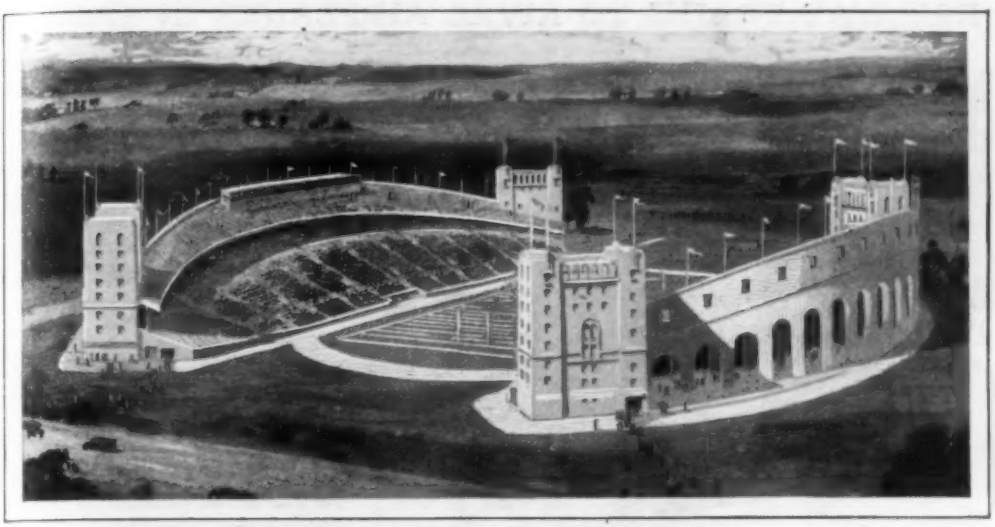
The Adam's apple, and not the region of the heart or the solar plexus, as is commonly believed, is man's most vulnerable part, according to an English authority. It has been found that a slight blow may result in serious impairment to the breathing or swallowing, and that a hard blow may cause death. Japanese experts in self-defense methods demonstrate that a blow with the edge of the hand above the temple or ear may cause concussion of the brain or fracture of the skull, and that blows on the nape of the neck are dangerous.

SHEET-IRON HORSES PULL COACH

Life-size model horses cut from sheets of galvanized iron have been prepared from small photographs of the live animals to give the proper setting for an old stagecoach owned by a western collector. Slides were made from the snapshots, projected to the required size on a screen and the outlines marked on the iron, which was cut out. The sheets were then mounted on boards, and a few touches of paint completed the illusion.



Realistic Sheet-Iron Horses Modeled from Actual Photographs



Architect's Drawing of Northwestern University's Stadium, Now under Construction at Evanston, Ill.; Eventually, the Structure Is to Have a Third Deck, Affording, in All, Seats for 75,000 Persons

UNIVERSITY STADIUM TO SEAT SEVENTY-FIVE THOUSAND

Two decks of Northwestern university's new stadium in Evanston, Ill., will be finished in time for the first football game this fall, it is planned. Later, a third deck is to be added, giving a total seating capacity of 75,000, while, according to the plans, about 45,000 persons will be accommodated in the first two sections.

PUTTING FRUIT TO SLEEP

As a substitute for cold storage, an English professor has been attempting the preservation of fruits simply by keeping the air of the room in which they are placed at exactly the same temperature and degree of humidity. The effect is said to be a state of torpidity, halting decay. Apples stored by this method were found to be in good condition after four months, according to reports.

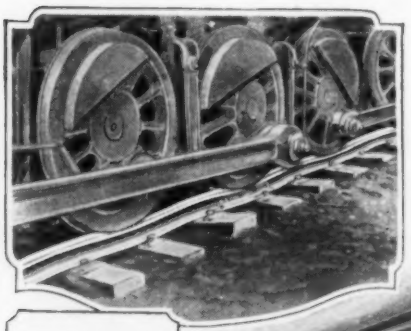
SCALES FOR WEIGHING EGGS AID IN GRADING

Should eggs be sold by the pound instead of by the dozen? The question was further discussed recently before the bureau of standards and scales for weighing individual eggs to determine their grade were demonstrated. Wide differences are found in the product and, for some time, the government has been attempting to establish a uniform system of grading throughout the country. Weight is already one factor in pricing and classifying eggs in larger lots. For instance, in Chicago the rule is that a case of thirty dozen No. 1 eggs must weigh not less than fifty-eight pounds. No. 2 eggs must weigh fifty-three pounds or better to the case.

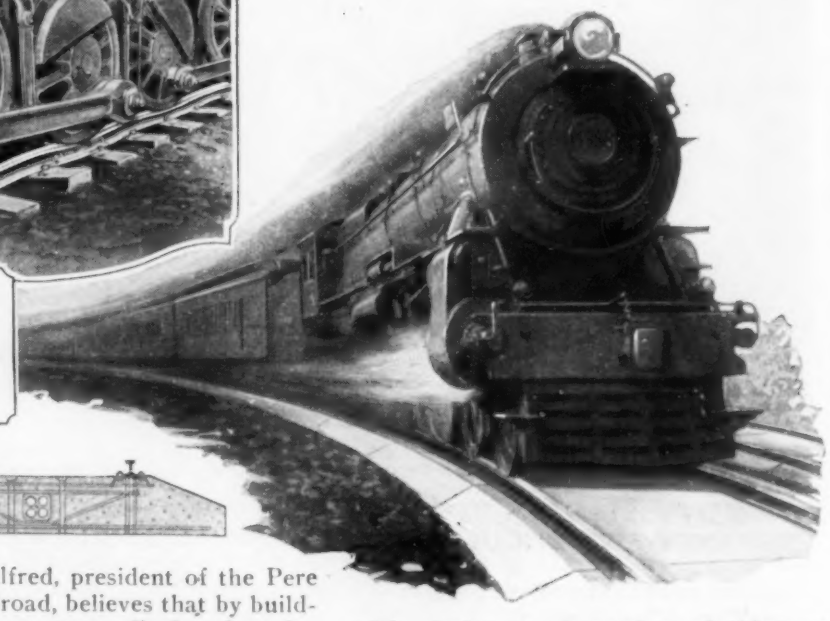
Special Scales for Weighing Eggs Separately as Basis for Determining Grade to Which They Belong

The requirements vary in different sections of the country.

RAILWAY TRAINS TO RIVAL AIRPLANES IN SPEED

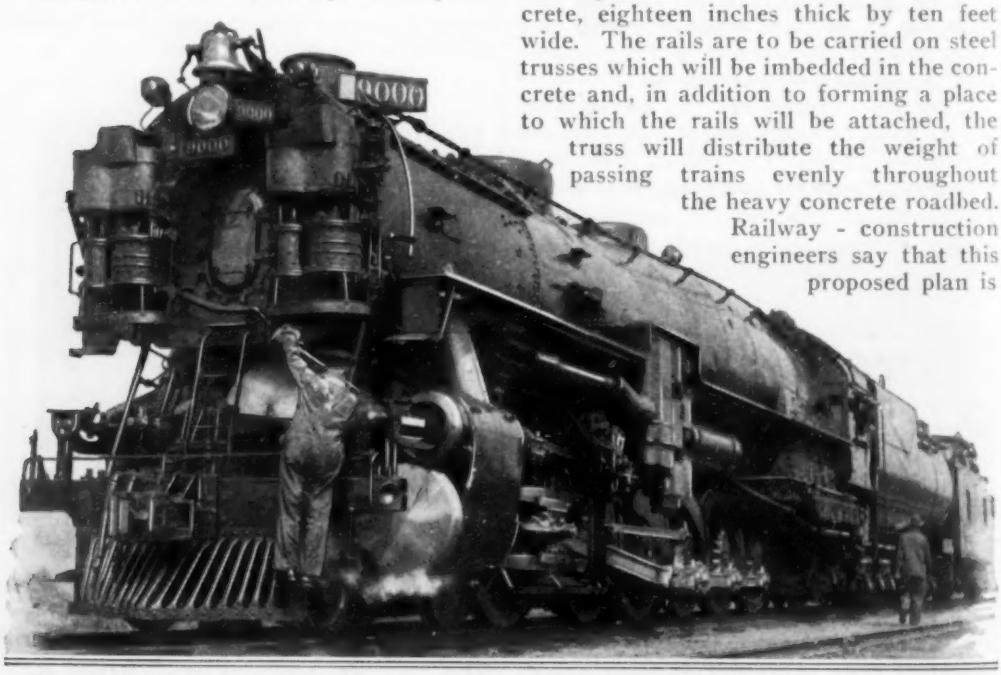


Ordinary Track, Above, and Proposed Cement Roadbed for High-Speed Trains



Frank H. Alfred, president of the Pere Marquette railroad, believes that by building a thick concrete roadbed and equipping locomotives and cars with roller bearings, a train may compete in speed with airplanes. A section of this new track is to be built near Detroit. The new-style roadbed is to be a slab of concrete, eighteen inches thick by ten feet wide. The rails are to be carried on steel trusses which will be imbedded in the concrete and, in addition to forming a place to which the rails will be attached, the truss will distribute the weight of passing trains evenly throughout the heavy concrete roadbed.

Railway - construction engineers say that this proposed plan is



High-Speed, Three-Cylinder Freight Locomotive Developed by Union Pacific Railway to Haul Mile-Long Freight Trains at Fifty Miles an Hour; It Is More Than 102 Feet in Length

novel and, if it proves successful, it will be the first revolutionary design in railway-track improvement. Tracks have always been built flexible so that, when a train passes over a section, the part bearing the weight is depressed, just as a plank supported at both ends bends when a heavy man walks on it. A train depresses the track underneath it until it is literally standing in a "trough" and always is climbing uphill. This will not happen in the rigid type of track for here the ideal of a steel ball rolling on a smooth, rigid surface will be approached. Due to decreased resistance, it is estimated that this type of a roadbed will save $420 a mile in fuel each year. But this amount is negligible as compared with the great economy of maintenance.

Log Raft Used on Glacier National Park Lake; Entire Craft, Including Oars and Locks, Was Fashioned by Hand

LOG RAFT ROWED LIKE BOAT OVER MOUNTAIN LAKE

Campers near a western lake utilized natural materials to fashion an efficient raft. It was made of small logs securely fastened together and propelled by crude oars also cut from poles. The seats were so placed that occupants were able to keep their feet dry.

WEATHER REPORTS BY RADIO TO GUIDE FLYERS

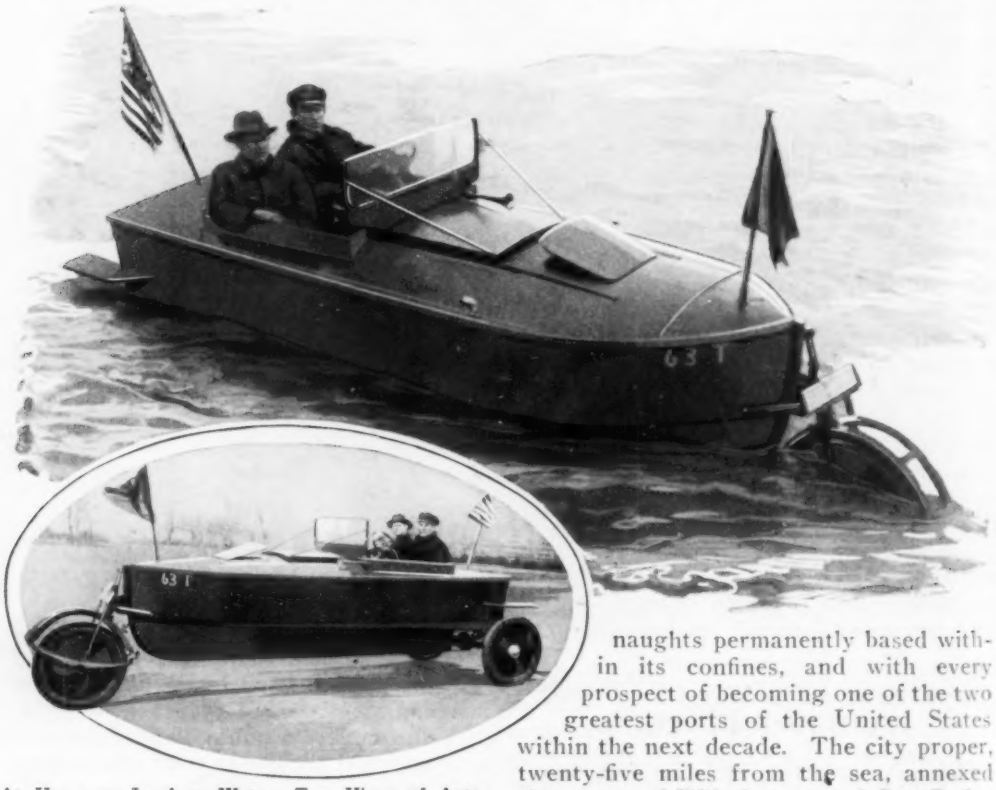
Bi-hourly weather bulletins broadcast from naval radio stations along the Atlantic coast have been started to safeguard aviators. Beginning at seven o'clock in the morning, the first outline of temperature and wind conditions is sent out on 550 kilocycles from each of the stations, with subsequent reports at intervals of every two hours. Fifteen minutes after each broadcast from the individual observatories, the messages are repeated from the radio station at Lakehurst on 3,475 kilocycles, so that each station will know the weather conditions near the others. The service will be extended as flights become more frequent in other areas.

WOMAN'S DESIGN FOR LIBRARY WINS IN NATIONAL CONTEST

Women have scored again in competition with men. First medal for a scheme of mural decorations for a library has been awarded to Miss Margery Stocking of Brooklyn, N. Y., in a contest in which 125 entrants from art schools throughout the country participated. The prize was awarded by a New York society. The students were given blueprints of plans and devised their designs from them.

Miss Stocking with Prize-Winning Drawing

LATEST BOAT ALSO RUNS ON LAND SERVING AS AUTO



At Home on Land or Water; Two Views of Auto That Serves as Boat or Car

Run by a propeller attached to the axle when it is in the water, a three-wheeled amphibious vehicle has passed a successful test recently, being driven from the highway into Lake Michigan, where it continued the journey, and then out again without stopping the motor. A large fore wheel is used for steering. There is ample room for two passengers, and the hull is designed to navigate safely in rough water.

TURNING SWAMPS INTO HARBOR COSTS THIRTY MILLION

Just seventeen years ago, the present site of Los Angeles harbor was a swamp and a mud flat—a little bay into which emptied a half dozen boggy sloughs. Today the same spot is the location of one of the busiest ports in the world, with docking facilities for the largest ships afloat; with the nation's great dreadnaughts permanently based within its confines, and with every prospect of becoming one of the two greatest ports of the United States within the next decade. The city proper, twenty-five miles from the sea, annexed the towns of Wilmington and San Pedro and, in return, promised to spend $10,000,000 within ten years in developing the waterfront. The federal government built a $10,000,000 breakwater nearly two miles long to shield the harbor. Business from the Panama canal justified enlarging on the first plans so that the total amount expended to date is nearly $30,000,000, giving Los Angeles forty miles of city-owned waterfront. The city builds the wharves and rents them to the steamship companies. Features of the work, besides the breakwater, are the outer harbor, embracing some 800 acres used for anchorage for the battle fleet and merchant ships that do not visit the docks, a main channel leading inland from the outer harbor and a turning basin at the upper end of the inner harbor where ships may reverse their course as they are not allowed to turn around in the channel. Oil and lumber are the principal commodities handled. One part has been set aside for pleasure craft and another for fishing boats.

FLOWERS DRIED IN SAND KEEP SHAPE AND COLOR

Lovers of flowers in their natural state are afforded a way of drying cut blossoms in sand instead of pressing them. The method requires dishes sufficiently deep so that the blossoms can be covered to a depth of at least an inch. White scouring sand will do. It should be laid half an inch deep in the dish, the flowers placed stem downward in the layer and then sprinkled over until all the petals and the entire blossom are fully covered. The flowers should be held firmly as this insures a complete dusting. When covered, they are placed in their dish in a warm, dry place. In about a week, some of the blooms will be thoroughly dried but others may require much longer. By this method, the blossoms are said to retain their natural shapes and colors even for years.

Courtesy Great Northern Railway

Tower and Close View of Wind Wheel Railroad Uses to Generate Current for Operating Light Signals

RAILROAD PUTS WIND TO WORK TO OPERATE SIGNALS

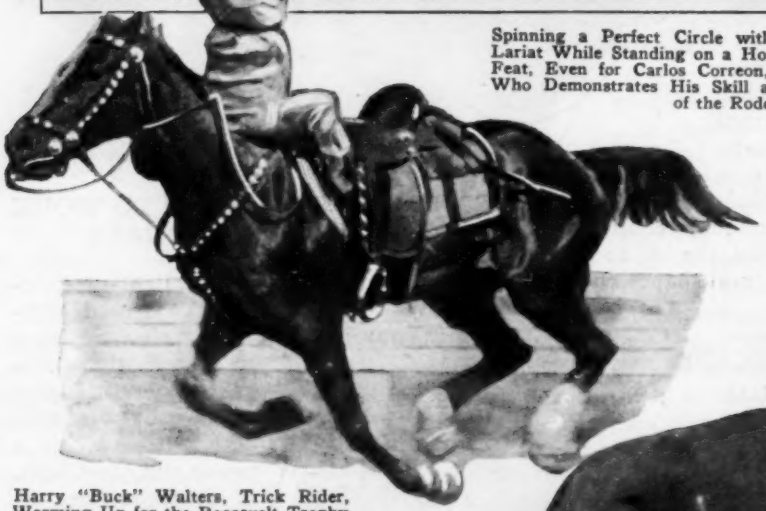
Batteries for low-voltage, light-type signals over several miles of the Great Northern railway are now being charged from an alternating-current generator operated by a windmill. The wheel is on a tower sixty feet high, is fourteen feet in diameter and differs from other mills of its kind in that it is mounted behind instead of in front of the pole and the tail is below instead of behind the wheel. The generator is of 1.2 kilowatts' capacity. The system is expected to save the railroad many thousands of dollars in signal operation.

ROPE FIRE ESCAPE HAS CONTROL FOR SPEED

Fitted with a clamp casting which has a screw wheel to regulate the speed of descent, a rope fire escape now on the market permits the user to lower himself quickly or slowly as he desires. The same casting also supports the shoulder rope fastened under the armpits. A person can descend from a height of four stories in from one-half to two minutes.

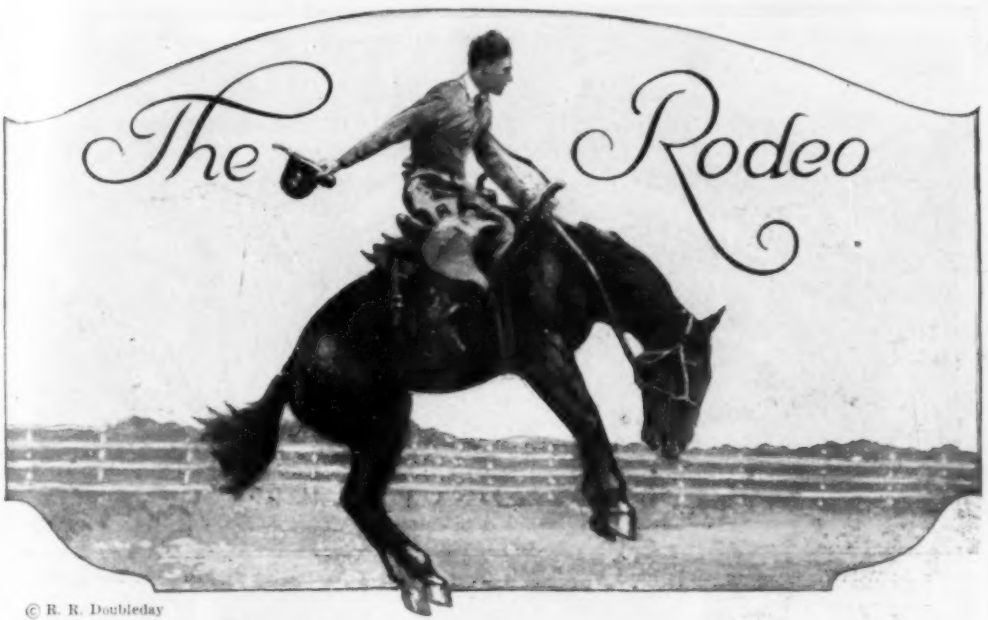
Lowering Himself with Rope Fire Escape; Regulator above Loop

Spinning a Perfect Circle with a Seventy-Five Foot Lariat While Standing on a Horse's Back Is No Mean Feat, Even for Carlos Correon, Mexican Rope Artist, Who Demonstrates His Skill as One of the Features of the Rodeos



Harry "Buck" Walters, Trick Rider, Warming Up for the Roosevelt Trophy Contest at the Pendleton Roundup

The End of a Perfect Ride on a Long-Horn Steer, Who Removes His Burden by Sending It Straight Up, and, at the Left, a Bull Dogger Starting to Throw His Animal by Twisting Its Head Sideways



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Cowboys and Girls from Western Plains Who Risk Lives in Thrilling Feats Are Amateurs, Competing Only for Prizes

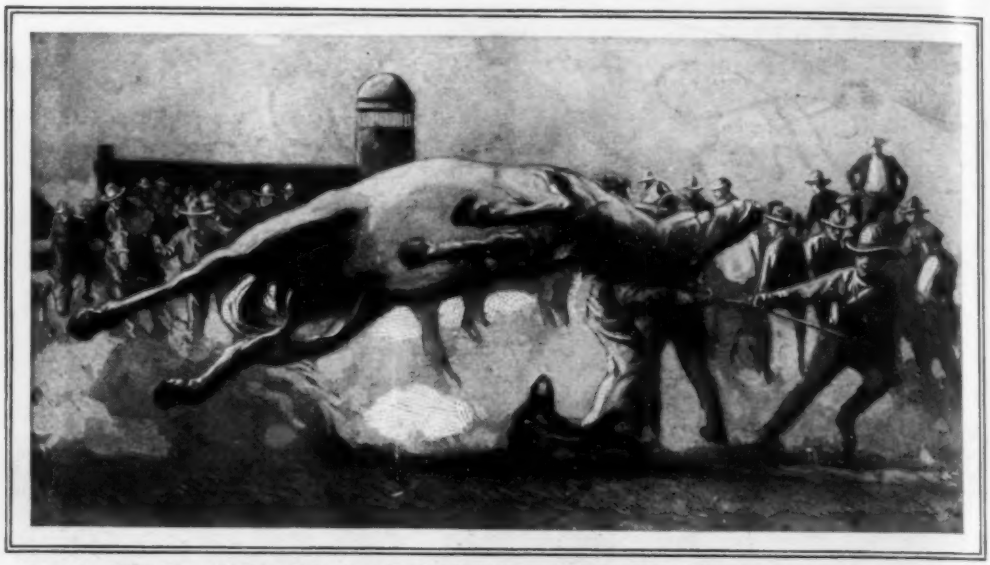
By BOB BECKER

OUT of the west, the land of cattle, expert horsemen and bucking broncos, there has come in recent years a new kind of sport to thrill red-blooded Americans who admire athletic skill, courage and daring. This is the rodeo, the great annual event of cowboy sports which is the Olympic of western life and tradition, and decides championship titles in bronk riding, steer wrestling, trick and fancy riding, calf and trick roping and bareback riding.

When the hard-riding cowboys who risk their necks atop wild horses first appeared in the middle west and east, the public had a faint idea that the rodeo was a kind of a wild-west show. But gradually the spectators have realized that the western classic is a series of contests, with no paid performers. The cowboys and cowgirls are "on their own." All that they receive for riding steers and bucking untamed bronks is what they can win of the big purses which are put up for each event.

But let Tex Austin tell about this "only pure American sport." Tex, as he is known from the cattle country of Texas to the Montana prairies, has lifted the rodeo from the little towns of the west where rival ropers and riders from different ranches used to compete for supremacy, to an international sensation. He started to work as a cow hand when he was just fourteen. A couple of years ago, Tex took 167 cowboys and cowgirls, a herd of 236 horses and 160 steers to England to compete for international championships at Wembley. On the opening day more than 100,000 spectators saw the finest riders and ropers that the west ever produced do their "stuff." Overnight the cowboy contests became a sensation, and in nineteen days, more than a million excited enthusiastic Englishmen stormed the stadium gates to see the Americans compete against one another.

Tex has invaded New York on two different occasions. The second rodeo he staged there brought 275,000 New Yorkers to the stadium where the cowboys and cowgirls competed for championships and $50,000 in prizes. Now Tex is introducing the cowboy sports to the middle west, as he staged a world-championship rodeo in



After the Wild Horse Is Roped, It Must Be Saddled; Above Is One of the Killers Objecting to the Saddling Process; Usually the Saddling Is Done in a Narrow Log Chute

Chicago last August, when $30,000 was handed out to winning contestants, and at present he is working on plans for another this fall.

"There is no other sport in the world that calls for the same endurance, gameness and skill and the same rivalry in competition," Tex said a few days ago in Fort Worth, Tex. Pushing his big Stetson to the back of his head and swinging his six-feet-four-inches of brawn and muscle from the saddle, he continued:

"Every contestant that competes in the world's-championship rodeo has to pay his or her expenses during the contests, and stiff entrance fees besides. And talk about it being on the level; say, do you think anyone could fix a bucking bronk or wild horse? They are out to do their wickedest, to throw the rider or wrestler, and the cowboys have to do their best because they get nothing if they don't win.

Throwing a Thousand Pounds of Unwilling Steer Requires Strength and Skill in Equal Proportions

"No athlete ever goes into a contest in better condition than a cowboy or cowgirl who takes part in a big rodeo. The bronk rider has to keep himself in perfect condition. The man with blurred eyes or soft muscles that don't pull together would be safer in a ring with Jack Dempsey than aboard such outlaw horses as Deerfoot, Overall Bill, Rawlins Gray, Headlight, Abe Lee, Heel Do, Black Thunder, Cross-O-Baldy, Broken Box, or any of

Steer Rider Clings to Horns and a Strap around Animal

Mabel Strickland, Champion Cowgirl Trick Rider, Above, Demonstrates Her Skill in and Out of the Saddle; Frequently the Stunt Riding Results in Serious Injuries

© U. & U.

Standing on His Head, the Trick Roper, Above, Throws His Lariat over Two Galloping Horses and Brings Them to a Stop; the Feats Performed with a Length of Rope Are a Constant Surprise to City-Bred Spectators at the Rodeo

Four Bears, of the Sioux Tribe, a World-War Veteran Who Won the Croix de Guerre, Shows How to Spin a Lariat While Lying on the Ground

the other dozens of bad actors at the Chicago rodeo.

"As another illustration, look at the steer wrestlers. Wrestling long-horned steers is one of the most dangerous sports in which the cowboys excel. The wrestler must throw himself from his racing horse to the horns of the steer, get a hold around its head and throw it in a few seconds. (The world's record is seven seconds.) He trains for this event for months. It takes courage of the first water. Why, Red Grange making a flying tackle on a gridiron has a soft job compared to the cowboy who makes a dive from a galloping horse to the steer's horns and wrestles it out with his weighty, mean opponent. Last summer at the Chicago rodeo, Johnny Roberts was painfully injured the very first day in a steer-wrestling contest. Did he quit? He did not. He tackled 'em every day even when each twist and strain meant pain. I've had contestants with broken ribs that refused to give up. I call that real gameness."

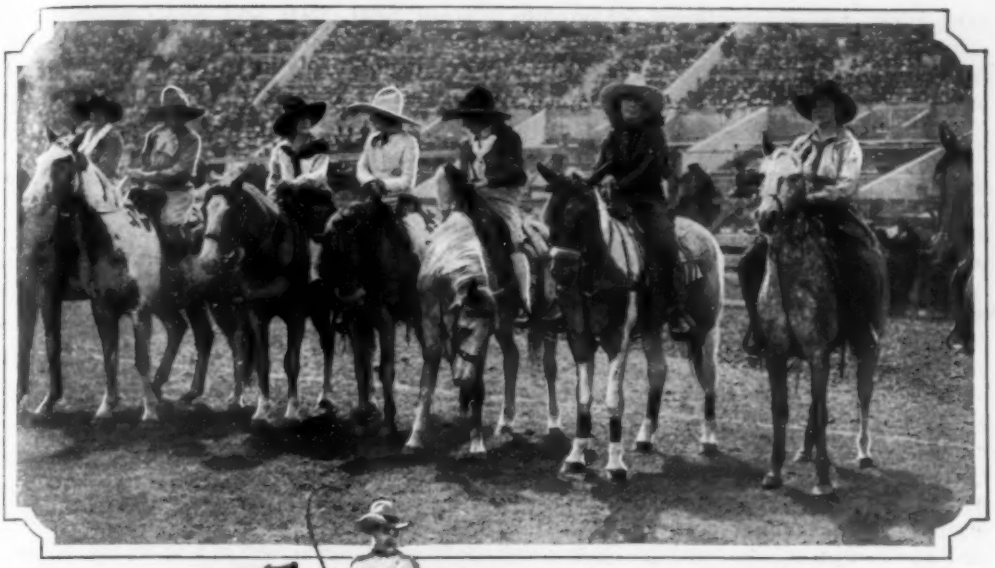
"Punkin rollers" haven't a chance in these world's-championship cowboy contests, according to Tex. A "punkin roller" is a would-be rider, a rank amateur who does not know how to stick in the saddle when a bronk begins to "Charleston." Only "top hands," the cream of all the west's best riders, ropers and steer wrestlers can enter the championship contests, which means that spectators are seeing the best-trained western athletes in the cowboy world.

Tex says that the present-day rodeo or cowboys' contest is simply an outgrowth of the intense rivalry that has always existed in the west between different cattle outfits. In the old days, whenever the cowmen from the various ranches got together, they would always brag about their wonderful riders and ropers, and—presto!—the war was on. After the cattle were shipped and the heavy work was over, the cowboys would meet to decide which outfit had the best bronk riders, trick ropers, steer wrestlers and bareback riders. Western towns used to foment these contests to decide championships. Finally towns pushed the contest idea until prizes totaling many thousands of dollars were put up for the winning cowboys. Out of these have grown the organized rodeos which have been held in Chicago, Fort Worth, Cheyenne, Pendleton, and other places in the west.

Tony, the Mount Used by Miss Ruth Roach in the Championship Rodeos, Is Equally at Home on Two Feet or Four; the Horses of the Trick Riders Are an Intelligent Lot

For the world's-championship rodeo "salty, hardboiled" mounts, outlaw animals which have the meanest reputation for vicious bucking, speed and other characteristics which go to make up a wild bronk, are secured. Riders who enter the saddle bronk-riding contests have no choice of mounts. The name of each horse is put on a piece of paper and the contestant pulls one blindly from a hat. He never rides the same horse twice during any one rodeo. After riding a different horse each day and trying to stay on its back, the contestant's score is tabulated. From this the judges decide who is the best rider. It's "hard stuff on the square," this rodeo game, besides which, as one observer commented, automobile racing is a pleasure.

When the cowboys and cowgirls were in England



Band of Cowgirls Lined Up for Parade before the Rodeo; Right, the Thrilling Moment in the Bull Dogging, When the Cowboy Leaps from His Horse to the Steer's Neck, While the Judge Alongside Times Him

The Wild Horse Wins the Bucking Contest; the Worst Unbroken Animals Are Gathered In to Supply Mounts

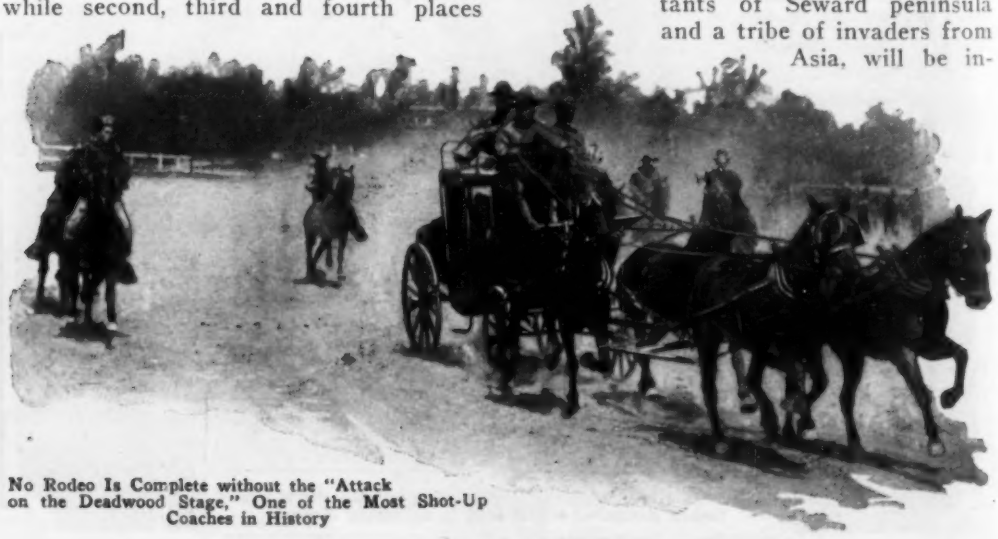
competing for international championship, the English thought there was some trick in it and pride in their horsemanship led a good many amateur riders into the ring to show up these picturesque cowboys from the States. The result was a good many laughs, not a few broken ribs and collar bones and a multitude of bruises and sore heads, as the outlaw horses tossed 'em far and wide.

Although the cowboys produce plenty of thrills for spectators at a rodeo, the performances of the girl bronk riders are more impressive if only for their novelty. Many of the girl contestants are married, and it is a case of husband and wife traveling long distances to compete for cups and cash prizes. Mabel Strickland, long hailed as the "Queen of the Cowgirls" and winner of many championships in trick and fancy riding, is the wife of an expert bronk rider. Ruth Roach and Nowata Slim also are married.

And does it pay? These western ropers and riders who put their skill and sometimes risk their lives against untamed horses and steers think so, as big rodeos put up big purses. The purse for the steer wrestlers' contests is $4,300. Each day a rider has the chance to win a first prize of $100, a second prize of $60 and a third bringing $40. All cash.

At the end of the nine days of contests, the wrestler making the best time on all steers wrestled wins $1,000 and the world's-championship title and solid-gold belt, while second, third and fourth places bring $700, $500 and $300, respectively. Another pot of gold containing $4,300 is put up for the bronk riders to shoot at. And a similar amount goes to the winners of the calf-roping contest, while trick and fancy riding, and other events, are also remunerative for the contestants who have class and can sweep the field.

But there is an old and ungrammatical saying in the west that "there never was a horse could not be rode, or a man who could not be throwed," and because this is true, there are thrills galore in the cowboy contests, where skill, gameness and pluck are needed to win over wild bronks and savage long-horned steers.



No Rodeo Is Complete without the "Attack on the Deadwood Stage," One of the Most Shot-Up Coaches in History

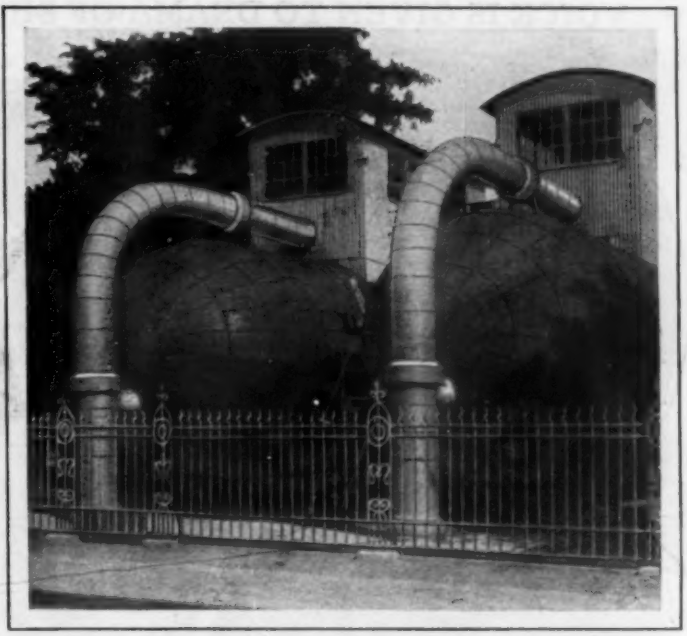
SAWDUST SOAKED IN ARSENIC TO KILL MOSQUITOES

Sawdust immersed in a weak solution of water and arsenic and scattered on breeding places from airplanes, is being tried by the United States marine corps as a means of combating the mosquito. The method is said not to be injurious to fish, birds or persons, because the poison is diluted.

ORIGIN OF FIRST AMERICAN SOUGHT IN ALASKA

Seeking evidence of early settlements in America, an expedition has gone to Alaska from the national museum. Eskimo legends, one of which relates to a great battle fought in ages past between the inhabitants of Seward peninsula and a tribe of invaders from Asia, will be in-

vestigated. It is supposed that the ancestors of the American Indians crossed over from Siberia and gradually worked their way down the Pacific coast and then east and south. Occasional finds of pottery and ivory objects support this theory, but also present a problem. The Eskimo makes no pottery, so the relics could not have been the work of his ancestors, and the ivory articles suggest a higher artistic development than is shown by the Eskimos of today. Identification of the tribes that left these objects is one of the purposes of the expedition. It is the opinion of scholars that no single invasion of America was made by primitive man, but that small groups drifted across the ice fields through periods of perhaps thousands of years. This would partly explain the differences that exist between the Indians in the three Americas.



Where Reserve Steam Power Is Held for Swedish City When Hydroelectric Plant Fails; the Two Accumulators

STORAGE TANKS FOR STEAM SUPPLY RESERVE POWER

When power from the hydroelectric plant of a Swedish city is interrupted, a steam supply, sufficient for operating the generators as long as an hour, is furnished immediately from two insulated accumulators. These are simply large iron tanks filled to within ninety per cent of their capacity with water raised to a temperature considerably above what its boiling point would be in the open air. When steam is drawn off, more is instantly available. A relatively small boiler is sufficient to keep the accumulators charged and ready for service. The insulation is such that heat losses are negligible even in low temperatures outdoors. Automatic valves keep the pressure in the tanks constant.

LAND ROWBOATS FOR CHILDREN HELP BUILD MUSCLE

Propelled with two hand levers which actuate chain and sprocket gears, a boat-shaped car for children has been devised by a western inventor as a healthful exerciser and amusement source. It has three gears, and the smaller cars, little more than sixty inches long, attain a speed of five miles an hour, while a larger one, for two operators, can be driven twenty miles an hour. Steering is accomplished by pulling harder on one side, a pivoted front wheel acting as a rudder. Automatic brakes are also provided for added safety.

Working the Handles Propels the Boat-Car Swiftly and Affords Healthful Exercise

VOICE IS GIVEN TO DRAMA OF SILVER SCREEN

Soundproof Camera Booth, Special Microphones Above and Recording Apparatus Showing Wax Disks

An invention which will bring to motion-picture audiences in every corner of the world the music of the greatest symphony orchestras and the vocal entertainment of the most popular stars of the operatic, vaudeville and theatrical fields, has just been announced. It will make it possible for every performance in a movie theater to have full orchestration accompaniment of the picture regardless of the size of the house. The apparatus by which combined films and sound records will be reproduced is no more complicated than an ordinary motion-picture projector nor is any special skill required of the operator. If the film breaks, there is no interference with the accuracy of synchronization. The sound record is not controlled by the film itself. For recording a microphone of an improved type, electrical amplifying apparatus and a record-cutting mechanism are employed. The recording can be carried on at a distance so that the actors may be grouped naturally in any scene and need not be crowded before a microphone. The second feature is an electrical reproducer which converts the movements of a needle in the grooves of a sound record into electrical vibrations. An important use of the new system will be in providing musical programs for pictures already taken.

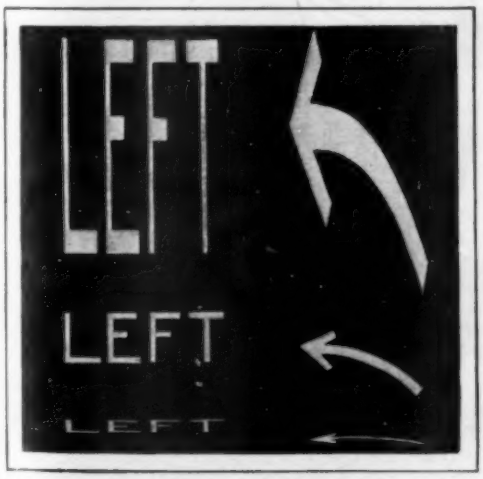
¶The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described will be promptly furnished by addressing the Bureau.

TRAIN MIND AS ALARM CLOCK TO WAKE AT CERTAIN HOUR

In India and other parts of the Orient, some natives have developed the ability to sleep a predetermined number of hours to a remarkable degree. An Indian scholar, for instance, slept three days and awoke within a half minute of the time set for arising, a traveler there reports. Others in that country are said to have such power of mental concentration that they can submit to minor surgical operations without apparent pain. Generations of study along the lines of applied psychology have produced these faculties, in the opinion of investigators.

OPTICAL ILLUSION TO AID AUTO SAFETY CAMPAIGN

Markers signifying which way automobiles should turn have been used successfully on English highways. They are in the form of arrows and other characters and are set flush with the surface of the pavement. While their adoption has been a help to the driver, it is suggested that improvements could be made so that the signs would not appear to be distorted, but remain clearly visible to an autoist twenty yards or so distant as well as when seen from above. The use of porcelain or studded glass insets is recommended so that



Different Styles of Pavement Traffic Signs Lettered to Overcome Distortion

the marks will not be so easily dimmed by dust and mud.

Automatic Phone with Ear and Mouthpiece Combined in One Unit; Transmitter Is Kept Proper Distance from Lips for Clear Speech

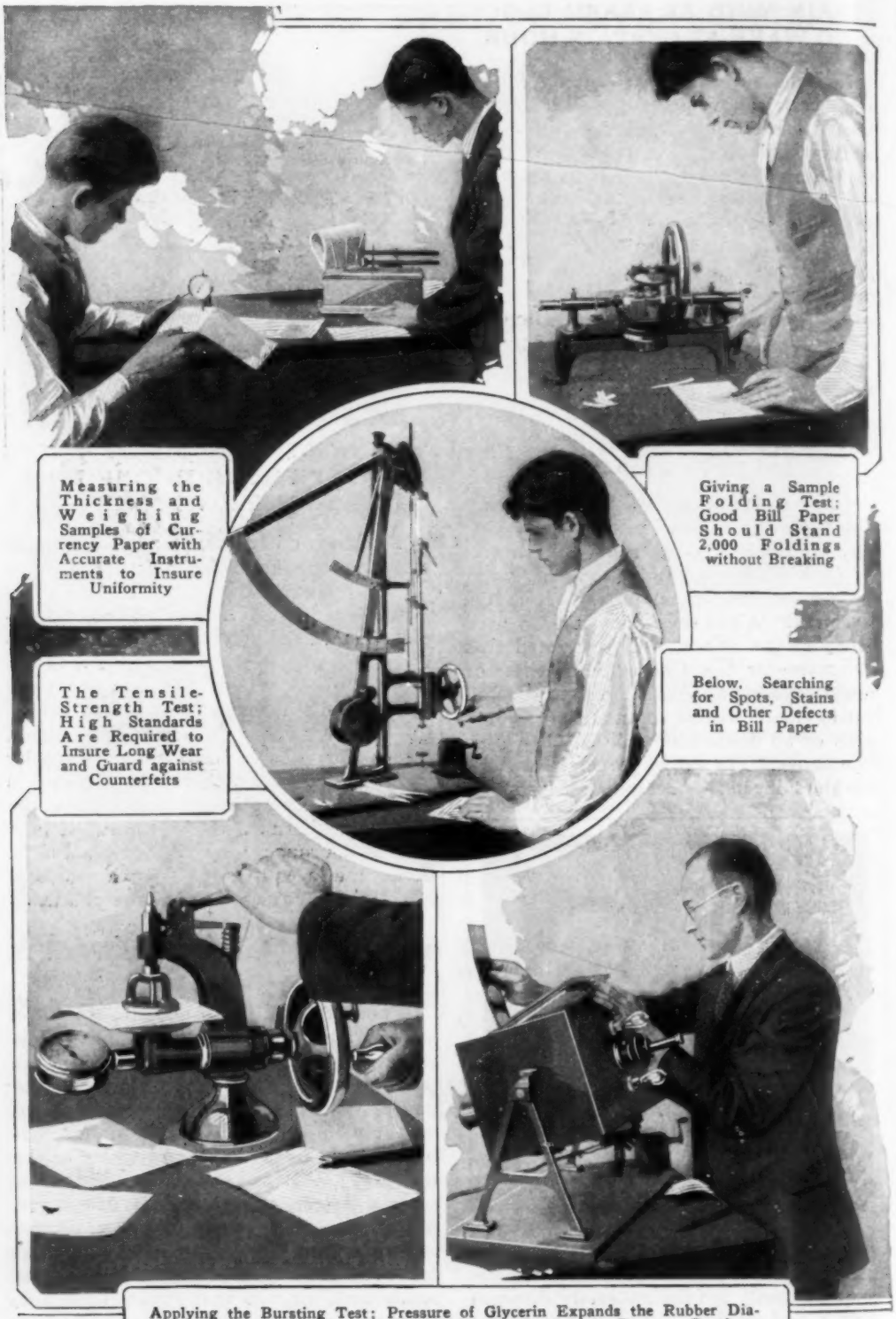
LATEST PHONE IN ONE UNIT TO IMPROVE TONE

Receiver and transmitter are combined in a unit telephone instrument similar to those used abroad, but said to be an improvement in that various mechanical defects have been overcome. The mouthpiece is so adjusted that it is always at the proper distance from the lips for clear speech and the cap is designed to deflect the sound directly into the transmitter. The quality of the voice is unaffected by the position in which the instrument is held. Contact springs for switching the circuits with the dial are concealed in a phosphor-bronze rest and are actuated through a lever by a small push rod, held in position by the weight of the phone.

MYSTERY OF COLORS REFLECTS WONDERS OF LIGHT RAYS

When you mix blue and yellow paint, a shade of green is the result, but yellow and blue lights intermingled produce a pink glow. Light itself is colorless, but passed through a glass prism, a beam of it is split into the radiant red, orange, yellow, green, blue, indigo and violet of the rainbow. What is commonly called color, as in a flower, for instance, is the result of the blossom's power to select, absorb and reflect only certain rays of light that fall upon it. A white object is one that sends back all rays that strike it. Black, on the other hand, absorbs the rays.

HOW UNCLE SAM MAKES YOUR MONEY LAST LONGER



Measuring the Thickness and Weighing Samples of Currency Paper with Accurate Instruments to Insure Uniformity

Giving a Sample Folding Test; Good Bill Paper Should Stand 2,000 Foldings without Breaking

The Tensile-Strength Test; High Standards Are Required to Insure Long Wear and Guard against Counterfeits

Below, Searching for Spots, Stains and Other Defects in Bill Paper

Applying the Bursting Test; Pressure of Glycerin Expands the Rubber Diaphragm Pressed against the Sample, Finally Causing the Paper to Break

WEAR ON YOUR PAPER MONEY INCREASED BY PROSPERITY

More than 1,200 tons of worn-out paper money is destroyed in the United States every year. Greenbacks, gold and silver certificates, which formerly lasted from eighteen to twenty-four months, now are put out of commission after eight to ten or twelve months of service. Dollar bills are even worn to shreds in the short period of five weeks. Our present use of currency is thrice that of 1916 and is six times greater than it was twenty-six years ago. Our use of currency has increased because our national prosperity has demanded a maximum of paper money in constant circulation. To make it last longer, the paper has been subjected to extraordinary tests which simulate the wear and tear to which the currency is subjected. An automatic eraser is used in a rubbing test, which duplicates the surface wear, a register keeping count of the total number of rubs. The test is completed when a hole is finally worn in the paper. As paper is susceptible to the weather, these tests are conducted in a constant-temperature chamber where the heat is seventy degrees and the humidity sixty-five. The folding test is carried on by special devices electrically operated. The paper specimens work over small rollers in such a manner that the material is folded again and again. An attachment keeps count of the number of folds, and when the sample finally breaks, the machinery stops and a bell rings. The currency paper will not break until exposed to about 2,000 foldings. Science also is armoring paper against dirt, dust and greasy stains. It is bathed in glue to cement together its fibers. Then, by spraying the paper with formaldehyde, a dirt-resisting coating has been developed. To prevent fraud, the dollar bills now bear the head of Washington. Lincoln adorns the fives. Jackson's face is on the tens, Cleveland's on the twenties, Grant's on the fifties and Franklin's on the hundred-dollar notes. A proposal to cut down the size of paper money to decrease the cost of replacement is being considered.

¶Africa is the original home of coffee; tea was first produced in Asia and cocoa in America.

Testing the New Fire Engine; the White Column Represents the Stream Rising Well over Tall Building

FIRE ENGINE'S SOLID STREAM TWO HUNDRED FEET HIGH

Pumping a two-inch stream of water 200 feet high without breaking it into a wider and ragged spray, as usually happens, was the performance of an improved type of fire engine in a southern city, recently. The liquid shaft rose thirty feet above a tall building before it broke, demonstrating how effective the apparatus would be in directing a solid column of water into the upper stories.

Canoe Folded into Pack and Collapsible Three-Passenger Boat in Use with Outboard Motor

MOTORBOATS FOLD INTO PACK FOR EASY CARRYING

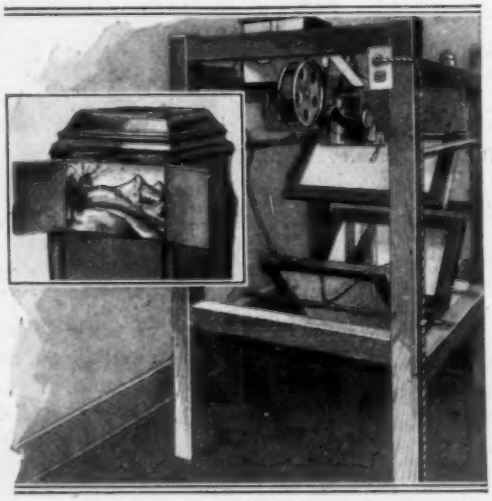
Folding boats and canoes with outboard motors, which can be bundled so that a man can carry them on his back or they may be strapped to the auto running board, are now offered to the camper who wishes to spend part of his time on lake or river. The smallest size, eleven feet four inches long, weighs only ninety pounds complete and collapses into a package about four feet long and less than a foot thick. Larger sizes, up to those having a capacity of six or seven persons, are made on the same pattern. The ribs are seated in automatic self-locking metal pockets so that they cannot slip out when the boat is assembled. The craft are made of extra-heavy waterproofed duck, and can be set up ready for use in a few moments.

CANCER IS CAUSED BY MILDEW SCIENTIST HOLDS

Cancer and various other diseases are caused by abnormal forms of mildew in the opinion of Prof. J. Tissot, of the Paris natural history museum. He holds that food is the source of many of these ailments, but is dangerous in this respect only when mildewed or rotten. In support of his theory, Prof. Tissot reports that he has transformed several bacterial cultures into mildew, and has found that the mildew which caused typhoid fever was identical with that of the mildew of maize, diphtheria with that of barley, and cholera of poisonous mushrooms. He discovered that the virus of measles was identical with the organism of mildew from lettuce, scarlet fever and rabies with the mildew of carrots, and smallpox, identical with that of potatoes. Tuberculosis cultures were transformed into mildew identical with that of the human organism, he says, leading to the belief that the disease develops spontaneously in man.

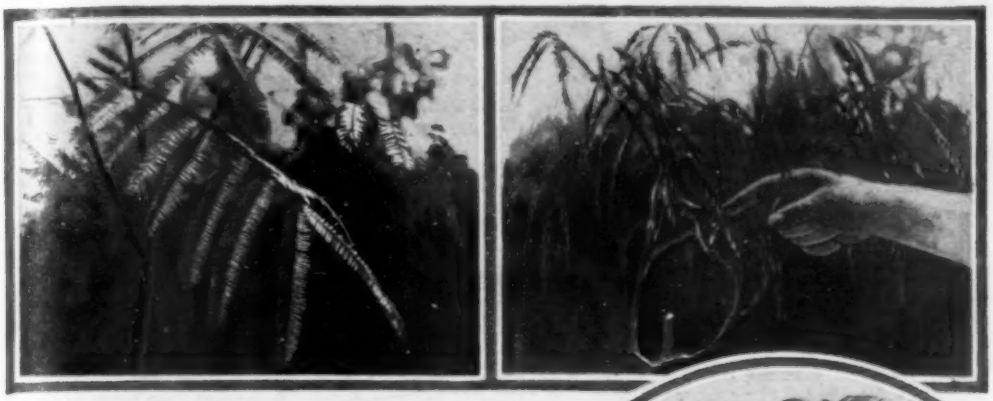
MOVIES IN HOME ARE SHOWN WITHOUT SCREEN

For home, school or commercial use, a cabinet somewhat resembling that of a talking machine has a translucent screen in the front, on which motion pictures are shown from a mechanism within the box. A particular feature is that "stills" also can be shown, the apparatus being adapted to the display of film from an ordinary small pocket camera. Pictures up to sixty in number can be fitted on a strip a yard long. When a motion film is used, it is fed horizontally and rewinding and threading are easily done, a special motor being installed for reversing the film.

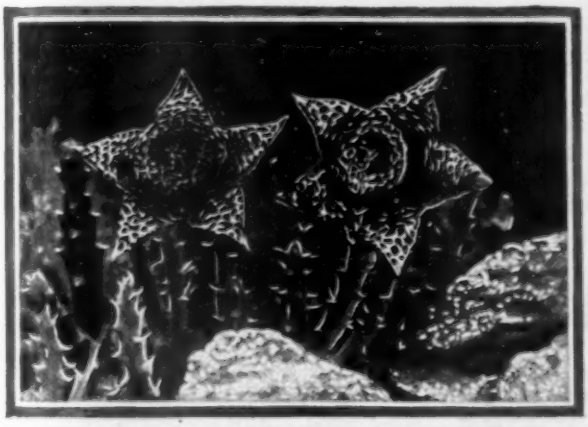


Interior of Motion-Picture Cabinet, with Inset Showing How Film Appears during Operation

A PLANT THAT SHRIVELS AWAY AT A TOUCH



Leaves of "Sensitive Plant" Normally Extended, and, at Right, Shut after Being Stroked with the Finger; They Open Slowly but Close Quickly at Only a Slight Touch

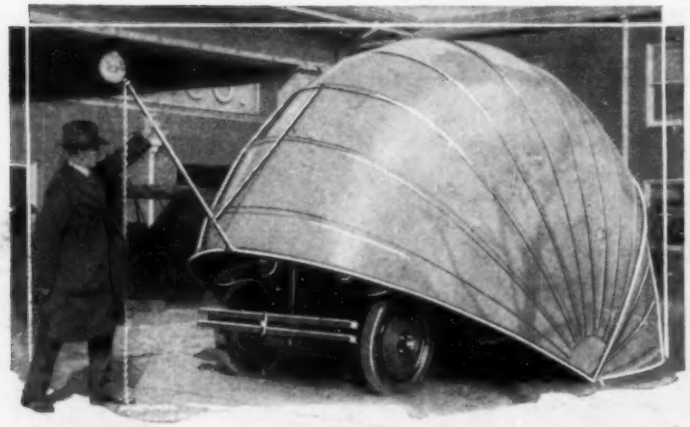


"Star of the Desert," a Rare and Beautifully Colored Cactus Blossom Has Stars within Stars to Its Center, But is Characterized by a Disagreeable Odor

The Electric Plant; Rubbing the Hand against Its Leaves Produces Shocks

Courtesy The Sphere

Three Phases in the Development of Castalia Daubiana, a Rare Water Lily; First, the Parent Leaf Floating and Attached Only by Stem; It Fades Away as New Leaves and Blossoms Form



Pulling the Shell over the Auto; Weighted Pole Handle Simplifies This Operation and Also Helps Throwing Cover Back

PORTABLE GARAGE OF METAL HAS FOLDING SECTIONS

Solution of the garage problem is offered by a southern inventor in a folding metal shell that is large enough to accommodate the average medium-sized car and takes up but little more room than the auto itself. It is constructed in telescoping sections and the front part swings on an axle for opening or closing by means of a weighted lever. The top, being curved, quickly sheds moisture and the entire garage can be easily moved.

ELECTRIC FLATIRON CAN'T BURN WORK

Electric current is turned on or off automatically by a switch in a flatiron just introduced, keeping it at the right working temperature and preventing scorching or more serious accidents. The operator need not worry about the current once the iron is connected and set to work. Leaving the cord in the socket with the electricity on does no harm, as the automatic switch will cut off the supply before the iron gets too hot and turn it on again, if too cold.

ALL U. S. SUBJECT TO QUAKES

Interest in earthquakes in this country has been centered largely on the Pacific coast in recent years, but temblors are not confined to that area. Some scientists believe that an earthquake risk exists in all parts of the country and is a nation-wide problem. As evidence of this, an eastern section of the Seismological Society of America has been formed to study quakes. Observatories now have such delicate seismographs that slight tremors as well as the severe shocks that do great damage are recorded, and by cooperation between the stations, they are able to find the location of a quake, sometimes before the shaking stops. Insurance companies are recognizing earthquake risks and, by collecting seismological data, are placing the writing of this kind of insurance on a scientific basis.

TRAVELING RADIO MUSICIAN RIVALS GERMAN BAND

German street bands have a rival in the traveling radio man and his portable receiver. He carries his set from a shoulder strap, an umbrella-shaped antenna brings in the music and the whole outfit is hauled on a tricycle.

Radio Concert Man on Tour with His Umbrella-Shaped Aerial, Loud Speaker and Set in Case on Back

© Pacific & Atlantic
The Largest Rotor Ship Yet Built Takes the Water; Scene at the Launching of the 3,000-Ton "Barbara," Constructed by the Transport Department of the German Government

BIG LINER WITH THREE ROTORS LAUNCHED IN GERMANY

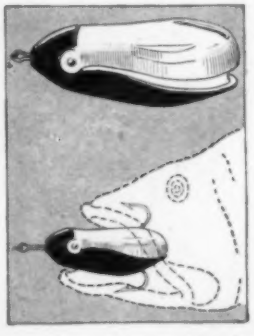
The rotor system of ship propulsion has been adapted to a 3,000-ton vessel, the "Barbara," recently launched by the transport department of the German government for the fruit trade with Italy and South America. The boat has three rotors, capable of developing some 1,200 horsepower, while it carries a 1,000-horsepower engine for use in times of calm. Anton Flettner's first rotorship, the "Buckau," now the "Baden-Baden," is of but 600 tons' displacement, but he believes that the principle will prove equally successful with the larger vessel.

WHICH WHEEL FOR NEW TIRE?

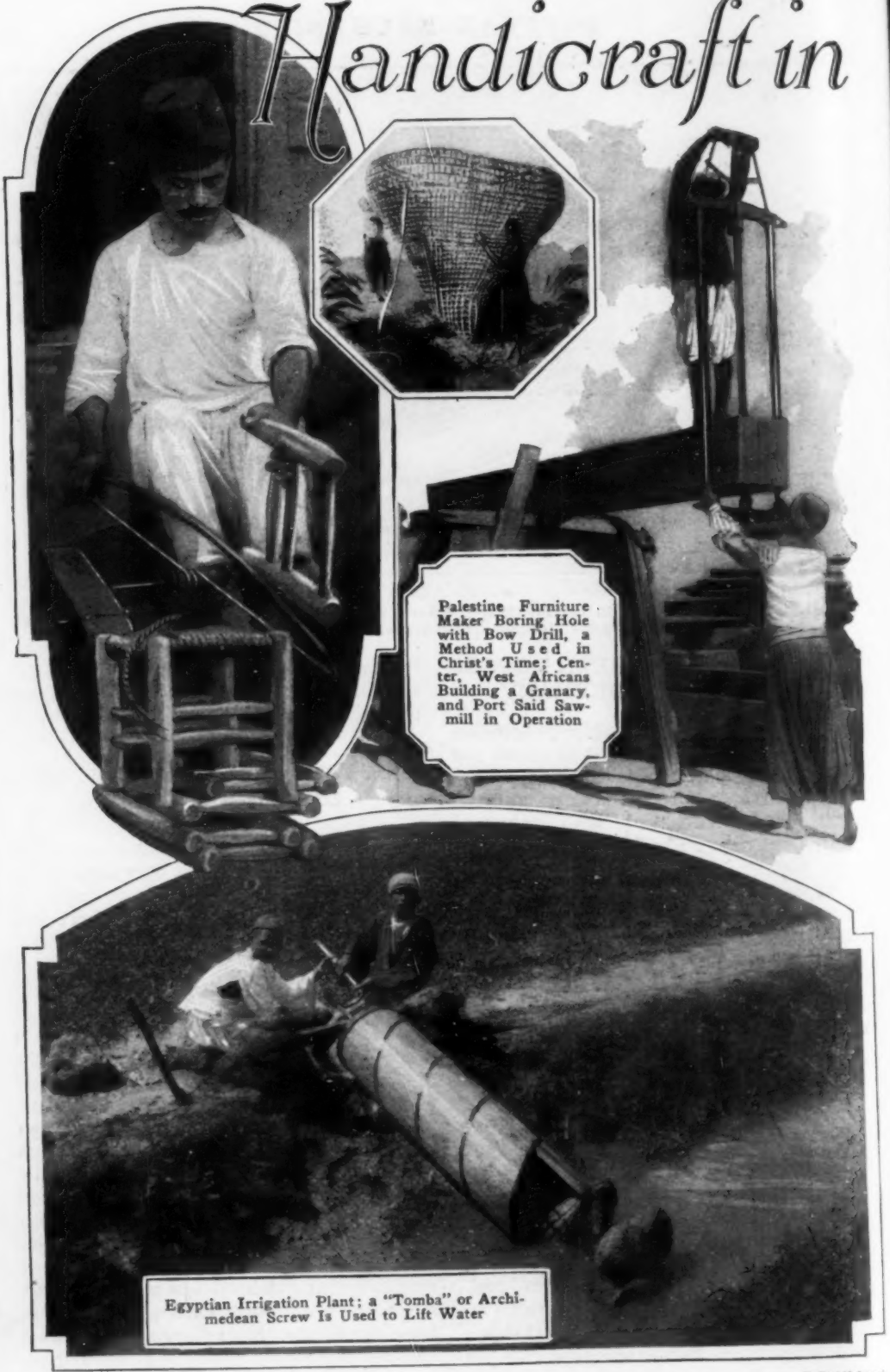
To obtain the longest mileage, the two best tires on a car should be placed on the rear wheels. Some drivers assert that the best tires belong on the front to minimize the danger from blowouts and the risk of losing control of the car, but this hazard is considered negligible, and the real fault usually lies in the driver losing his head. The spare should replace the more worn of the rear tires at the end of several thousand miles of driving. On new cars, all tires may remain as originally placed for several thousand miles, then the front ones should be put on the rear wheels.

JAWS OF FISH SPRING HOOKS ON WEEDLESS BAIT

Hooks are concealed within an automatic lure for fish so that they cannot become entangled in the weeds or catch on snags but are automatically released when the bait is struck. The exterior is made of pyralin and the mechanism inside of brass. In tests, this bait has been dragged through rushes and lily pads, over matted weeds, and it also has been floated into snags and allowed to sink to the bottom. In cases where the hooks were sprung, it was fish that did it. Even when the bait came down on shore hard enough to release the hooks, they returned to the shell because the pressure was not maintained.



Handicraft in



Palestine Furniture Maker Boring Hole with Bow Drill, a Method Used in Christ's Time; Center, West Africans Building a Granary, and Port Said Sawmill in Operation

Egyptian Irrigation Plant; a "Tomba" or Archimedean Screw Is Used to Lift Water

© Publishers

Remote Places

Weaving Cashmere Shawls in India, and a Porto Rican Lace Maker

Jerusalem Artisans Inlaying Silver in Brass; the Ware Is Known as Damascus Work

Photo Service

With Days of the Ox Team Almost Forgotten, Modern Loggers Adapt the Motor Truck to a Special Railroad for Hauling

POLE ROAD FOR MOTOR TRUCKS SIMPLIFIES HAULING LOGS

Rainy weather and mud, serious obstacles to the log haulers, have been overcome by white-cedar cutters in southwestern Oregon by building a road of poles nearly two miles long. It is like a railroad, motor trucks and trailers with specially flanged wheels attaining a speed of four to five miles an hour and climbing grades as steep as four and one-half per cent even when loaded. The road can be built for about ninety cents per lineal foot and from 12,000,000 to 16,000,000 feet of lumber can be hauled over it before extensive repairs and alterations are necessary, the builders estimate. Some of the logs are swung high on aerial cables across deep canyons before they start their journey on the motor way. Then they go successively by river, flat car and finally by steamer to the Orient or to some destination in this country. Japan at present is the largest importer of white cedar from the United States.

TREES ARE AID TO HEALTH

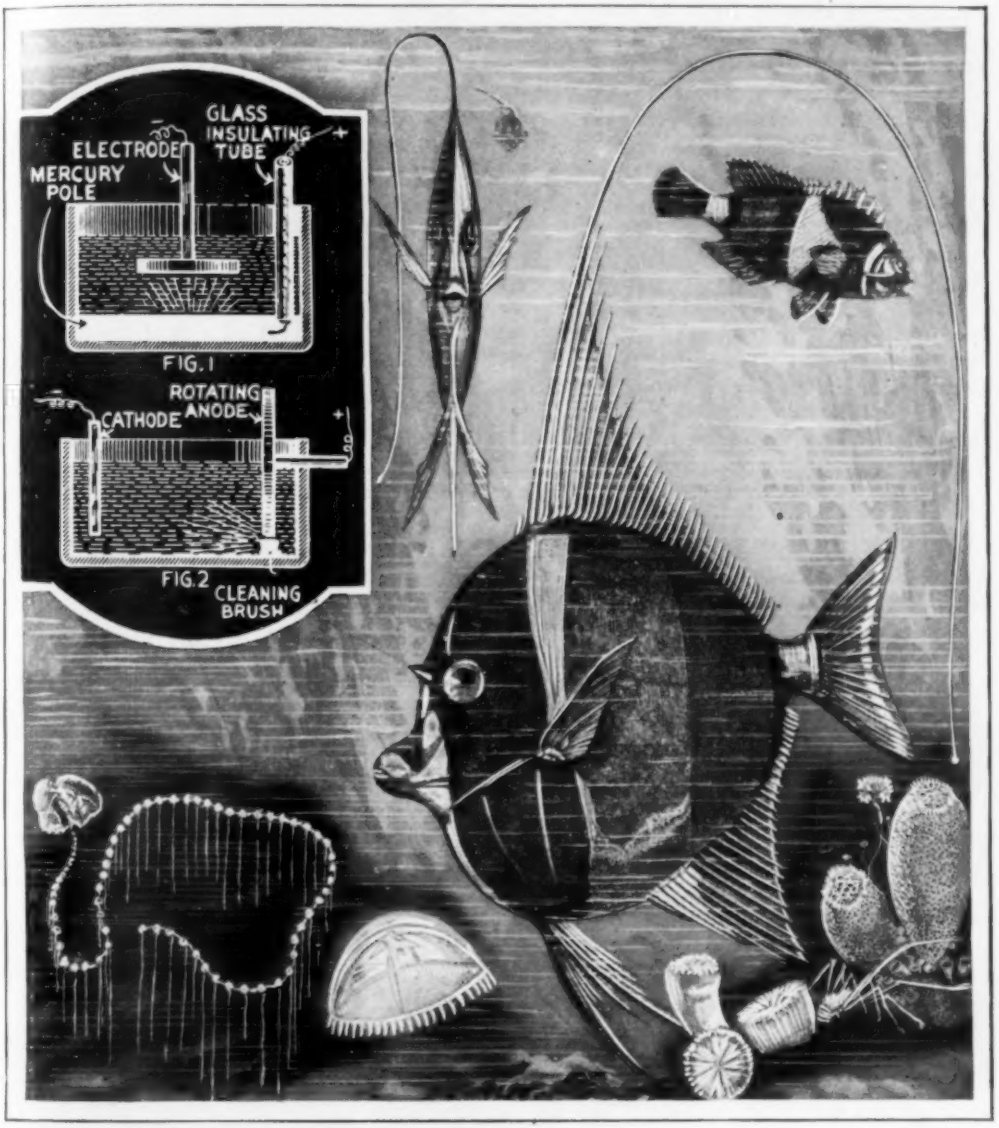
Increase in insanity and crime as well as minor nervous disorders may be expected when persons are forced to live in an environment deprived of natural beauty, in the opinion of Donald F. Abel, a psychologist. Man's desire for green trees, grass and other objects of nature, is one of the fundamental cravings, he declares, and if it is deprived of satisfaction, trouble is likely to result. Some cities are recognizing the importance of planting trees within their borders not only for beauty's sake but for the welfare of the citizens. A decrease in insanity among inmates was noted at a state prison following the beautifying of the grounds.

ESKIMO EYESHADE FOR MOVIES GUARDS ACTORS' VISION

As a protection against "Kleig eyes," a malady sometimes suffered by motion-picture actors from too much exposure to the brilliant studio lights, an eyeshade the Eskimos use to prevent snow blindness is said to have been found effective. It is fashioned of bone and rawhide, and lined with fur. Narrow slits provide a partial view while shutting out the glare of the lamps. The shade is worn while the performer is resting or awaiting appearance before the camera.

Motion-Picture Actress Wearing Eskimo Shade to Protect Her Eyes from Strong Studio Lights

HEATLESS LIGHT SECRET SOUGHT FROM NATURE



Photos Courtesy Dr. E. B. Harvey

Cold Light in Nature, and Two Ways of Producing the Same Phenomena by Simple Experiments; at the Left Is a Luminous Praya, Next Sea Jelly, Then a Pruning-Knife Fish, with Front View Above, and in the Lower Right Corner Are Luminous Corals, Crustaceans and Sponges

One of nature's greatest secrets is the production of heatless light and power. Hundreds of animals, fish, insects, germs fungi, vegetables and flowers, produce cold light. Many of the fish living in the deepest parts of the oceans have luminous organs. Some of these take the form of lanterns, or hanging lamps, that stand out from the head or other parts of the body to light their way to catch food. Many of the jellyfish, seaslugs and crustaceans, sponges, coral worms, starfish, sea urchins, wheel animalculæ, seaweeds, crabs, lobsters, snails, squid, octopus, frogs, toads and minute bacteria are very luminous. With man-made light, however,

only a fraction of one per cent of the energy in the coal that generates the present form of electric light in use is converted into light. The bulk of it is dissipated as heat. Experiments in the mechanical production of cold light have taken numerous forms. Zinc sulphide and similar phosphorescing substances, like luminous paints used on the faces of watches and clocks, have been tried. But these are not of great practical value. Chemical reactions are all capable of emitting light. We cannot see light emission in many, but that is simply because they are not carried out rapidly enough. Whenever we are able to carry out a chemical reaction quickly, and without a noticeable development of heat, we obtain what has been termed a cold light. Vacuum tubes, however, have given the best results in man's effort to rival nature. D. McFarlan Moore, in 1896, developed tubes to give what he termed "etheric" light. He placed various gases in his tubes and fitted each tube with a "make-and-break" vibrator of the kind used with electric bells. The object of the vibrator was to interrupt the current so as to intensify the glow. The greater the number of vibrations the brighter is the light. Another type of vacuum light has been developed by C. F. Dussand, of Paris. He mounts a number of ordinary tungsten incandescent lamps on a revolving wheel and connects each lamp with an electrical circuit. Each rotation of the mounting wheel lights and cuts off the current and the speed of the wheel makes it possible to light each lamp for an exceedingly short period. This produces the effect of a continuous glow. The rotation speed is arranged so as to cause the time of lighting of each lamp to be half the duration of its darkness. Although none of these methods have proved entirely satisfactory, it has been demonstrated that the production of the so-called cold light is possible, opening an alluring field to inventors.

AUTO IS RUN BY AIR PROPELLER ON WATER, SNOW OR ICE

Driven by an airplane motor and propeller, a five-passenger auto constructed by a Maine inventor has a boat-shaped body so that it can run on the water. Air-tight pontoons on both sides under the running boards add to its buoyancy and the car will travel also over

Views of Versatile Air-Driven Auto; Band over Propeller Blades Insures Greater Safety

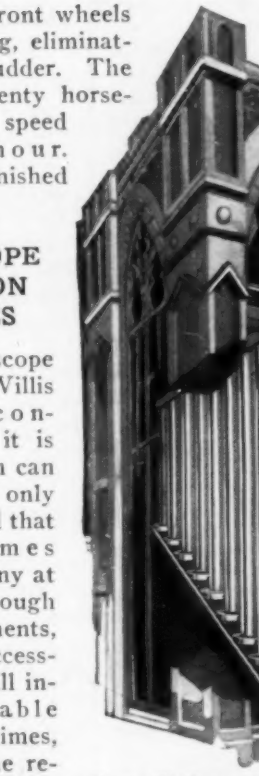
ice or snow. The front wheels are used for steering, eliminating the need of a rudder. The motor develops seventy horsepower, affording a speed of sixty miles an hour. The interior is finished like a limousine.

HUGE TELESCOPE TO SHOW MOON AT TEN MILES

With a huge telescope Prof. George Willis Ritchey is now constructing in Paris, it is hoped that the moon can be seen as though only ten miles distant and that stars now 15,000 times farther away than any at present visible through the largest instruments, will be seen. If successful, the telescope will increase the observable universe millions of times, it is estimated. The reflector will be nineteen feet eight inches in diameter, and it required two years to build the special furnace in which the glass is to be prepared.

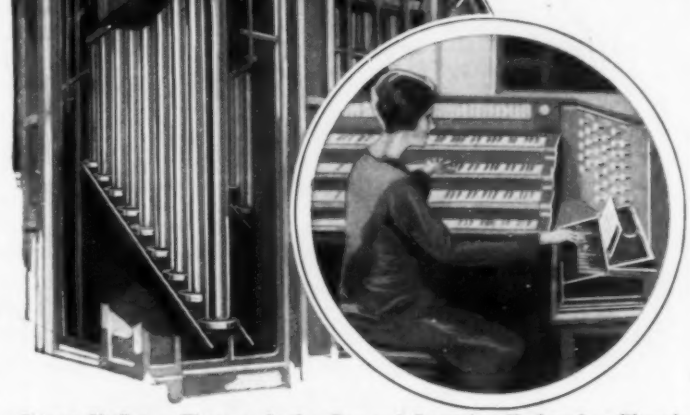
ZINC GOLF TEE EASY TO FIND OR PUSH IN HARD GROUND

Shaped so that it can be easily pushed into hard ground as well as into turf, a zinc golf tee is plainly visible because of the brightness of the metal, lasts a long time and will not damage the blades of the lawnmower even if it is run over, for the zinc cuts easily. The stem of the tee is channeled for quick insertion and the metal is so stiff that it is not likely to bend under considerable pressure.



TOWER CHIMES ARE OPERATED BY ELECTRIC KEYBOARD

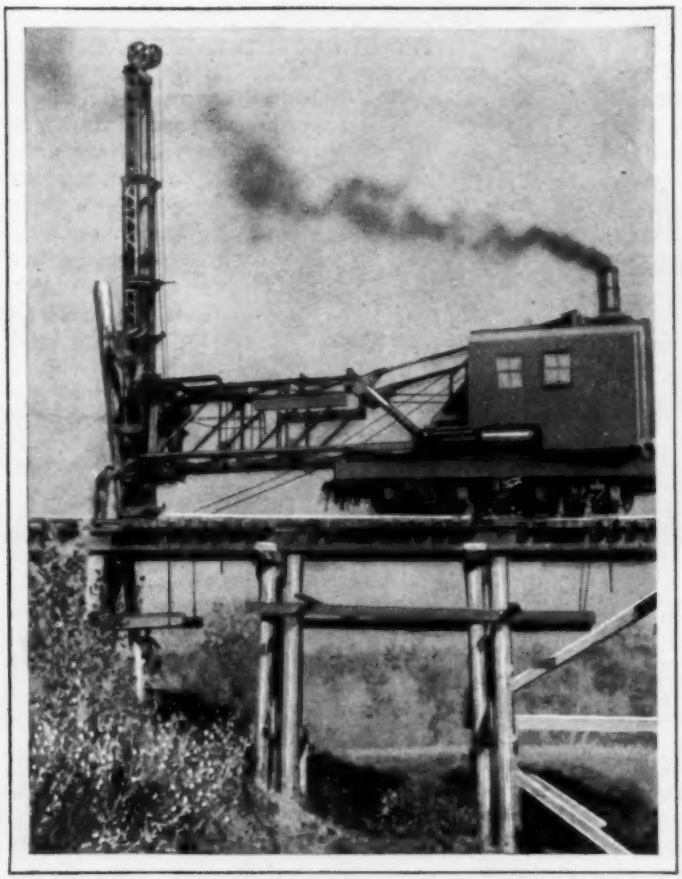
Played by an electric keyboard several hundred feet away, a set of tubular chimes in a tower on the mountainside at Avalon Bay, Santa Catalina island, furnishes tourists pleasing music and is also used for radio programs. To aid the player, telephone apparatus transmits the tones to him as soon as the key is pressed, so that he does not have to wait for the vibrations to reach him through the air. Silencer or tone dampers are also installed on the chimes, shutting off the tone of one just as the other is played. This prevents muffled and overlapping sounds, often the cause of unsatisfactory results in ordinary sets of chimes. The keyboard is like that of an organ and actuates electrical apparatus which strikes the tubes.



Chimes Similar to Those at Avalon Bay and Operating Keyboard at Player's Right; Silencers Prevent Slurring Tones

LINOLEUM FROM WASTE PAPER

Serviceable floor linoleum from paper on a flax or jute canvas backing is being made in England. To cheapen the product, waste paper is used in the process. During the repulping, the paper undergoes a secret chemical treatment which is said to render it as tough as leather. The covering is said to dye well.



Combination Outfit in Use as a Pile Driver; It Can Easily Be Converted into a Crane for Heavy Lifting

CRANE AND PILE DRIVER IN ONE AID RAILROAD WORK

Combination pile drivers and cranes now in railroad service have proved practical as they save the loss incident to keeping one outfit idle when two separate units are kept, and certain features of the arrangement adapt it to hard service as well as exacting duty. For instance, it has a full-circle swing, so that piles can be driven at either end of the car and rigid construction permits crowding and driving piles that are not inclined to go straight. A long truss allows driving thirty feet from the center line of the track or twenty-one feet and a half ahead of the front axle. A regular crane boom can be substituted for the truss when it is desired to use the outfit for service as a locomotive-crane.

GRAPE SEED YIELD MOTOR OIL

Extracting lubricating oil from grape seeds is reported to be a budding industry in southern France. The product is said to be especially adapted to delicate motors such as those of airplanes, and is replacing castor oil which had to be imported. Chemists have discovered a way to eliminate the high acid content from the grape oil, a substance that formerly limited the use of the product and now several plants are preparing the oil in connection with distilling operations. Seven or eight gallons of oil can be made from the seeds of a ton of grapes.

PHONOGRAPH THAT FITS IN HANDBAG

Music for picnics and camping trips is supplied by a midget phonograph that fits the pocket or a handbag and yet plays records up to ten inches in diameter. Features of the compact outfit are a speed and tone regulator and a special sound box. The phonograph folds into a round nickel case about the size of a tobacco pouch.

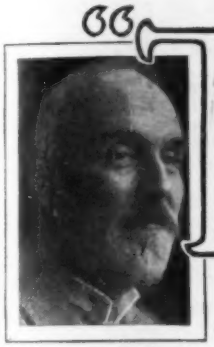
Courtesy Keith Prouse

Phonograph Packed, and Below, Ready for Playing; It Takes Ten-Inch Records or Less

What Is Your Pet Brain-Twister?

"Puzzle Genius" Tells How He Invents Problems and How They Furnish Entertainment and Profit

By FENN SHERIE



Henry E. Dudeney

"THE solving of problems is part of our very existence," declares Henry E. Dudeney, who is known in England as the "Puzzle Genius." "Perplexities large and small confront us every hour of the day. Every task we undertake, every game we play, has its own little set of puzzles—some of them easy, others apparently insoluble—and our brains are continually grappling with them. If there were no puzzles to solve there would be no questions to ask—and then what a dull world it would be!

"For puzzle solving is only another name for reasoning; the unfortunate people who cannot solve puzzles have to be sent to lunatic asylums—because, as we say, they have lost their reasoning powers. Some people imagine that a man who is constantly applying his brain to puzzles and problems must be a crank. On the contrary, puzzle makers—and puzzle solvers—must of necessity be clear-thinking, logical people."

Mr. Dudeney speaks with authority, for he has been inventing puzzles and problems for nearly sixty years.

"As I have already explained," he continued, "I have been of an inquiring turn of mind ever since I can remember. Like most children, I took an interest in all things problematical from a very early age, and 'Why?' and 'How?' were two of the first words in my vocabulary.

"As a youth I took a great interest in mechanical toys and the various puzzle games they sold in the shops. Conjuring tricks—which, after all, are only puzzles of which the performer tries to hide the solution—also fascinated me.

"I once saw an illusionist perform a 'Vanishing Lady' trick. The lady stood in the center of the stage. Four attendants came on and erected a kind of tent round her. The illusionist fired a pistol, the tent collapsed, and the lady had apparently vanished into the air.

"I was extremely mystified and tried to fathom the secret by a process of deduction. The lady could not have escaped through the wall at the back of the tent, I reasoned, for the trick was performed on a bare stage in a local church hall. There was no trapdoor in the floor. Yet she had left the stage somehow. Then my mathematical mind got to work. How many people were there on the stage at the commencement of the performance? Two; the illusionist and the lady. Four attendants had entered to erect the tent. Two plus four equals six. So far, so good.

"Then in a flash, a possible solution came to me. I went to see the show again and carefully counted the number of attendants who left the stage after the tent had been erected. There were five! The problem was solved.

"That incident may seem irrelevant, but I mention it to emphasize that the secret of solving problems is to develop the art of 'exact thinking.' Even mathematics—frequently regarded as the schoolboy's terror—can be made fascinating if only the teacher will endeavor to show that its whole foundation is the science of 'exact thinking,' and that dry-as-dust problems can be solved by methods similar to those of Sherlock Holmes, the schoolboy's hero."

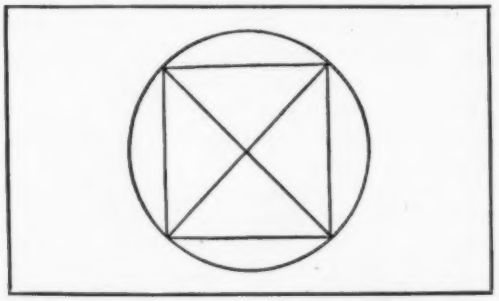
"When did you begin to publish puzzles?" I asked.

"At the age of nine," Mr. Dudeney replied. "I made up one or two simple little teasers to amuse my brothers and sisters—there were nine of us in the family—and somebody suggested that I should send them to a boys' paper. To my great delight they were accepted, and I received five shillings each for them."

"Can you remember any of them now?" I asked.

"Yes; here is one.

"I will warn you that it is done by a trick—as you will see when I show you the solution later."



Can You Draw the Figure Shown with One Stroke of the Pencil, Never Lifting the Pencil from the Paper or Going Over a Line Twice?

Although the history of puzzles goes back to ancient times, there is no trace of any man prior to Mr. Dudeney having devoted his life to the study of them. Most of the mathematicians who earned fame as makers of problems have been one-puzzle men. For instance, one man's reputation as a puzzlist rests upon a single problem, called the "Fifteen Schoolgirls," which is as follows:

How could fifteen schoolgirls walk out on seven days in triplets without any girl ever walking twice in a triplet with another girl?

It is not the answer to a problem that interests the puzzle king, but the solution —which is quite a different thing; and for that reason his fame among the professors of higher mathematics is no less than it is among the solvers of puzzles.

I asked him to explain how his popular problems are devised.

"More often than not," he said, "I discover a mathematical principle which interests me, and then I wait until I can think out a means of disguising and dressing it up in such a manner that it will appeal to the general public.

"For instance, has it ever occurred to you that if it were possible to remove the hub of a wheel and continue the spokes to the center, a little problem would present itself?"

I said that it had not.

"What do you think would happen?" he asked.

"I suppose they would all meet," I replied.

"On the contrary," said Mr. Dudeney, "wherever any two spokes met they would form a barrier which would prevent any other spokes meeting on the same plane. Perhaps I can explain the principle more clearly by setting you a simple little problem."

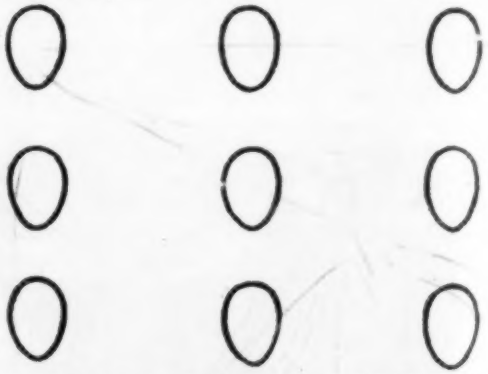
This was the problem:

Take six cigarets and try to place them together so that each cigaret touches the other five.

I did my best to solve the little teaser, but had to admit defeat. Mr. Dudeney promised to show me the solution at the conclusion of our interview.

"Of course, it is not always an easy matter to word a problem clearly and concisely so that the conditions shall allow no opportunities for quibbling," he continued. "Some puzzles are propounded purposely to trap the unwary, and quite naturally people are apt to seek loopholes in every teaser they attempt to solve. I remember once that, after wording a puzzle with extreme care to make sure that there could be no possible quibble, I received a most amusing solution. It was the old 'egg' problem in which nine points had to be connected, using 'the fewest possible straight lines.' A reader claimed to have solved it by drawing a single straight line, pointing out that he had fulfilled the conditions by making all the rest crooked!

"Here is the diagram in case you may like to try it."



Can You Connect These Nine Eggs with Only Four Straight Lines?

"You referred just now to puzzles which had a 'catch' in them," I said. "Do you consider that such problems may be regarded as legitimate puzzles?"

"Certainly," said Mr. Dudeney. "They all constitute valuable tests in the art of exact thinking. Here is an example:"

A lady was seated in her private chamber when her son entered. Upon receiving the parental command, "Depart, my son, and do not disturb me," he replied: "I am of a truth thy son; but thou art not my mother, and until thou hast shown me how this may be I shall not go forth."

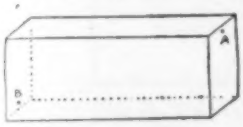
Mr. Dudeney smiled at my expression of perplexity.

"Don't bother about the solution now," he said; "I'll tell it to you presently."

"What do you consider your most popular problem?" I asked, renewing the assault.

"The one which I call 'The Spider and the Fly,' Mr. Dudeney replied. "Here it is."

Inside a rectangular room, measuring thirty feet in length and twelve feet in width and height, a spider is at a point in the middle of one of the end walls, one foot from the ceiling, as at A; and a fly is on the opposite wall, one foot from the floor in the center, as shown at B. What is the shortest distance that the spider must crawl in order to reach the fly, which remains stationary? Of course, the spider never drops or uses its web, but crawls fairly.



"The idea for that problem came to me in an idle moment while I sat in my chair smoking and gazing at the ceiling." Mr. Dudeney explained. "And, strangely enough, the method of solving it occurred to me almost as soon as I had conceived the puzzle itself. I was rather surprised, therefore, to find that it gave rise to a great deal of discussion and controversy when it was first published. When I show you the solution presently you will see that it may be obtained by a comparatively simple process of deduction.

"Quite a large proportion of the letters I receive come from hospitals. On one occasion I received a letter from a medical officer explaining that one of his patients, a wounded man, was suffering from insomnia because he could not work out the solution to one of my problems, and he begged me to forward it to him secretly so that he could pretend to help the poor fellow to solve it. I did as requested, and had the satisfaction of hearing that the ruse worked successfully.

"Again, I receive a remarkable number of letters asking for a solution of the old problem, 'Water, Gas, and Electricity.' I receive, on an average, three or four letters a week asking for the solution, so you may perhaps care to publish it again."

The Puzzle Is to Lay On Water, Gas and Electricity from W, G and E, to Each of the Three Houses A, B and C, without Any Pipe Crossing Another

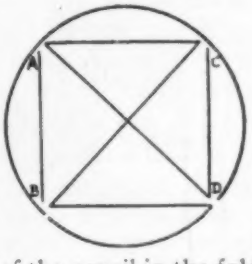
"Regarding the process of 'exact thinking' to which you have referred," I asked, "can you explain by a simple example how this may be applied?"

"Certainly. For instance, I have heard people argue for hours upon end over the old conundrum, 'Brother and sister have I none, but that man's father is my father's son.' By 'exact thinking' it is easy enough to see that 'my father's son' is either myself or my brother. But as it is clearly stated that I have no brother, it must refer to myself. The problem, simplified, now becomes, 'That man's father is myself.' Obviously 'that man' is my son. It seems simple enough, but there are still thousands of people who are unable to solve it clearly because they will not grasp the fundamentals."

"And now will you give me the solutions to some of the brain-teasers you have shown me in the course of our chat?" I asked.

Mr. Dudeney took up a pencil and paper and bade me sit beside him at the table.

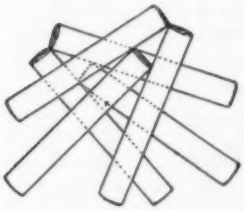
"Let me see," he commenced, "the first problem—the one I invented as a boy—was to draw this figure without lifting pencil from the paper.



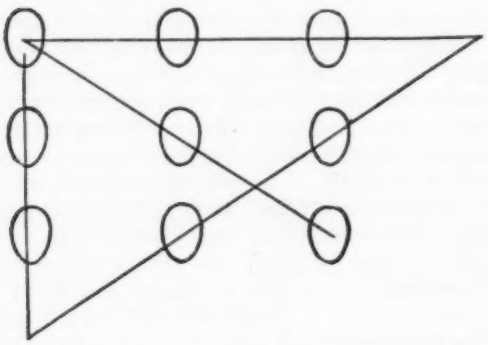
"I mentioned that it was done by a trick. The trick is to fold the paper. Then, by inserting the point of the pencil in the fold, two straight lines, A B and C D, can be drawn in one stroke. Now straighten out the paper without

moving the point of the pencil from D, and the figure may be completed in the single stroke.

"Now for the cigaret puzzle. You discovered at the first attempt how three cigarets could be placed together so that each touched the other two. What could be easier, therefore, than to arrange the other three cigarets in a similar fashion and place them transversely across the first three?" I kicked myself for not having seen the solution before, and then turned to the egg problem.



"This is equally simple," said Mr. Dudeney. The nine eggs can be connected by four straight lines, thus:

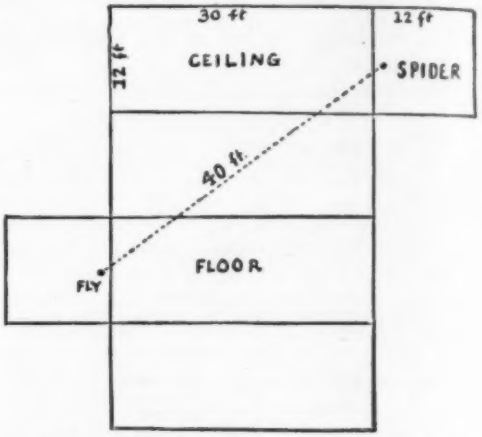


"The 'catch' in the puzzle concerning the youth who received the parental command, 'Depart, my son,' is simply that the command came from his father, who also happened to be present.

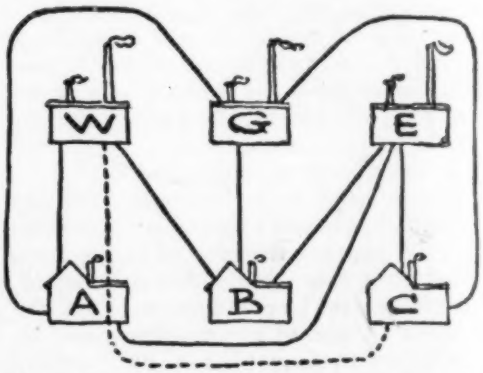
"The 'Fifteen Schoolgirls' puzzle is solved as follows. Give the girls the numbers 1 to 15 and they can be grouped in this manner for the seven days:

1st day	15	1	2	11	10	14	7	4	12	13	8	6	3	5	9
2nd day	15	3	4	13	12	2	9	6	14	1	10	8	5	7	11
3rd day	15	5	6	1	14	4	11	8	2	3	12	10	7	9	13
4th day	15	7	8	3	2	6	13	10	4	5	14	12	9	11	1
5th day	15	9	10	5	4	8	1	12	6	7	2	14	11	13	3
6th day	15	11	12	7	6	10	3	14	8	9	4	2	13	1	5
7th day	15	13	14	9	8	12	5	2	10	11	6	4	1	3	7

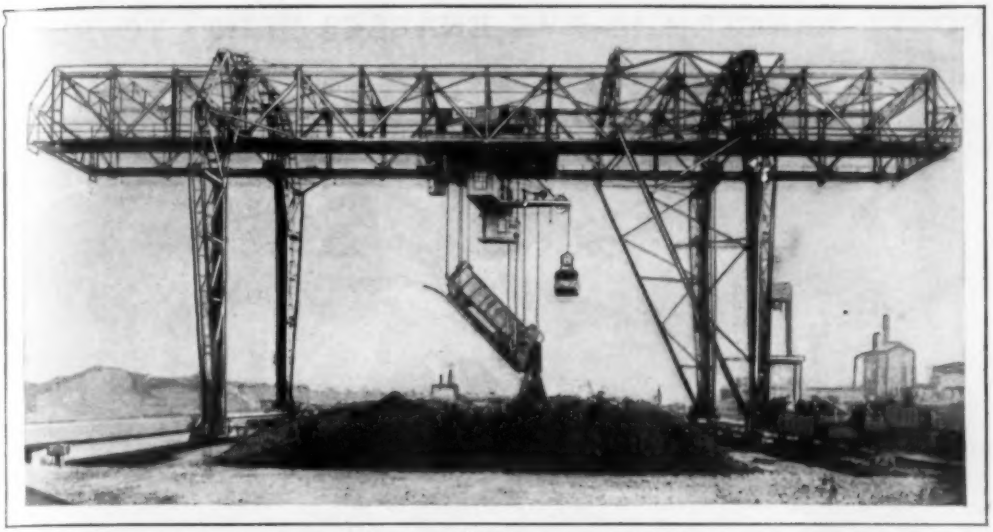
"To solve the puzzle of the spider and the fly, imagine the room to be a cardboard box. Then the box may be cut in various different ways so that the cardboard may be laid flat upon the table. If you cut it as shown in the diagram and take the shortest route between the spider and the fly, as indicated by the dotted line, you will find that the distance is exactly forty feet. It will be seen that the spider actually passes over five of the six sides of the room.



"Now for the 'Water, Gas and Electricity' teaser. According to the conditions, in the strict sense in which one at first understands them, there is no possible solution. In such a dilemma always look for some verbal quibble or trick. If the owner of the house A will allow the water company to run their pipe for house C through his property (and we are not bound to assume that he would object) the problem may be solved as shown in the diagram."



Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information. Send no stamps; the service is free.



Powerful Coal Unloader in Operation; Cars Are Lifted from the Tracks, Moved to the Dumping Heap and Then Tipped, Permitting the End Gate to Open and the Contents to Run Out

CRANE PICKS UP FREIGHT CARS AND EMPTIES THEM

Cars are swung from the railroad tracks, tipped on end and dumped at the rate of fifteen an hour with a huge crane constructed for a German coal company. The powerful hoist is suspended on a bridge that has a span of 125 feet.

SKY WOULD BE BLACK ON MOON AND SHADOWS VERY DARK

Due to the absence of an atmosphere, scholars say that landscapes on the moon would appear vastly different from those on earth, could a person visit our earth's satellite. Instead of blue, the sky would be black and shadows would be extremely dark although reflected light from other surfaces than those exposed to the direct rays of the sun would modify them to some degree. Distant peaks would stand out in bold relief, and because the moon is relatively much smaller than the earth, objects would disappear more quickly because of a closer horizon. In one of the flat-bottomed "craters," all that could be seen would be a plain with only the tops of the highest summits ranging as a rampart about it, but in the black sky overhead the stars would sparkle despite the presence of the sun during the lunar day. The earth would appear as an enormous moon. Light reflected from it upon the satellite is visible to us here as a faint illumination of the dark part of the moon at dawn or evening, when it appears as a slender crescent.

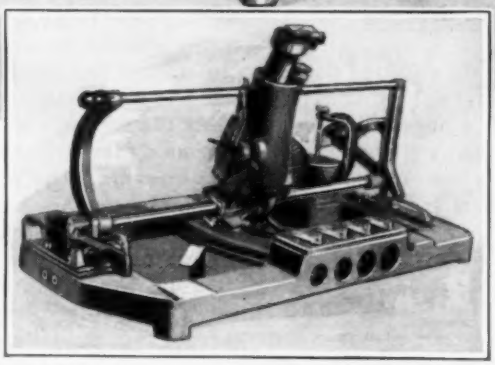
© Henry Miller

Plant Growing inside Tightly Sealed Glass Bulb; Air and Water Were Used Repeatedly

PLANT GROWS IN SEALED BULB

That a plant can grow inside of a hermetically sealed glass bulb was demonstrated before the National Academy of Sciences. Water drawn up through the roots and evaporated from the leaves was condensed on the sides of the glass and, running down, used again.

NOVEL ELECTRICAL EYE ENABLES BLIND TO READ



Blind Man Reading as Type Is Translated into Sound; the Perforated Disk and Instrument Uncovered

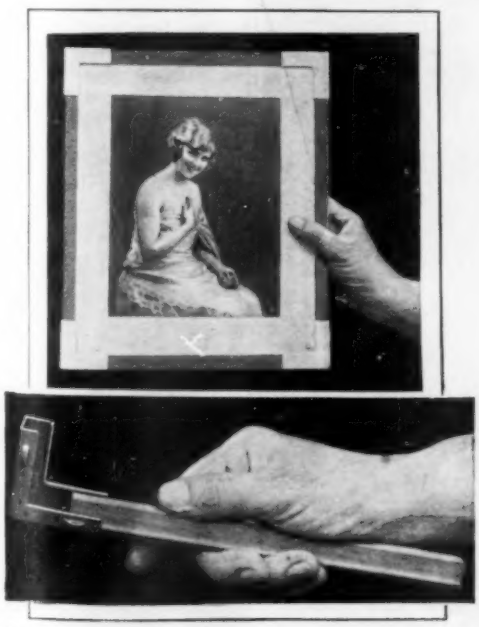
A remarkable electrical instrument enabling the blind to read ordinary printed matter laid on it, has been invented by an English professor. By its use, blind people can read their newspaper or favorite book almost as easily as normal folk. This device translates printed type into sounds which are heard in a telephone receiver strapped over the head and ears. The brain of the "optophone," as it is called, is selenium, a metal which has the strange property of varying its resistance to the passage of an electric current according to the intensity of the light falling upon it. A telephone receiver is connected with a battery and the sensitive selenium. When light is flashed from an electric bulb onto the selenium, a current passes to the telephone in which musical sounds are heard. The pitch, or musical note of the sounds depends on the frequency of the light pulsations. A blind person wishing to read a newspaper or book printed in ordinary type, or a typewritten letter, simply places the printed page, face downward, on a glass plate supported by a book rest. The selenium tablet is just under the glass plate, and its upper surface is pierced so that a ray of electric light passes up through the glass to the book or paper. A motor rotates a disk pierced with five rings of concentric circles, and, as it revolves, the light from the electric bulb beneath is projected by lenses onto the type to be read. This light forms on the printed page five bright spots in line. Each letter on which the light falls produces a different sound in the earpiece. The blind have to learn an alphabet of sound, which can be done in twelve to twenty hours. The reading of words is practiced, at first, on a simple book, such as a child's primer, and in many cases a reading speed of over 60 words a minute has been attained in three to four months.

NON-SECTARIAN RADIO PARISH HAS NINE DENOMINATIONS

Representatives of nine religious denominations have organized a radio parish in Maine with their own pastor and a group of business men, and others interested, to assure financial support. The action was taken largely as a result of the many responses received from radio fans on hearing the minister's sermons when he was pastor of another church. He resigned so that he might give his entire time to the radio audiences.

FRAME YOUR OWN PICTURES WITH METAL CORNERS

Pictures can be framed in a few moments even by inexperienced persons with the aid of metal corner pieces now on the market. They replace the ordinary miter joint which requires careful cutting and fitting. The pieces are shaped to hold molding strips that form the sides of the frame. These strips are cut to the required lengths and with square ends, and then simply inserted in the corner pieces. Small brads or nails, driven from the back side, are used to hold them in position.



© C. A. Oldroyd

Picture in Finished Frame and Inserting a Side in the Slot of the Metal Corner

Trimmer in Use, and Inset Showing Its Narrow Saw Blade and Connection to Pole

POLE SAW FOR TRIMMING TREE SAVES CLIMBING

Weighing only eight pounds, a narrow-bladed saw and long pole for trimming trees permit cutting limbs as high as twenty feet above the ground and up to six inches in diameter. An additional advantage is that the operator can stand at one side, thereby protecting himself from falling branches.

FORM HOT-DOG VENDERS' UNION TO HELP TRADE IN BERLIN

A union of "night sausage dispensers" has been organized in Berlin to stimulate the trade in frankfurters and rolls. The venders are said to hold a virtual monopoly of the sales and have combined to increase the outdoor business which is sometimes brisk after theaters. Members of the organization wear white uniforms and dispense their merchandise from nickel kettles.

QUAINT DOLLS ARE FOUND IN ALL PARTS OF WORLD

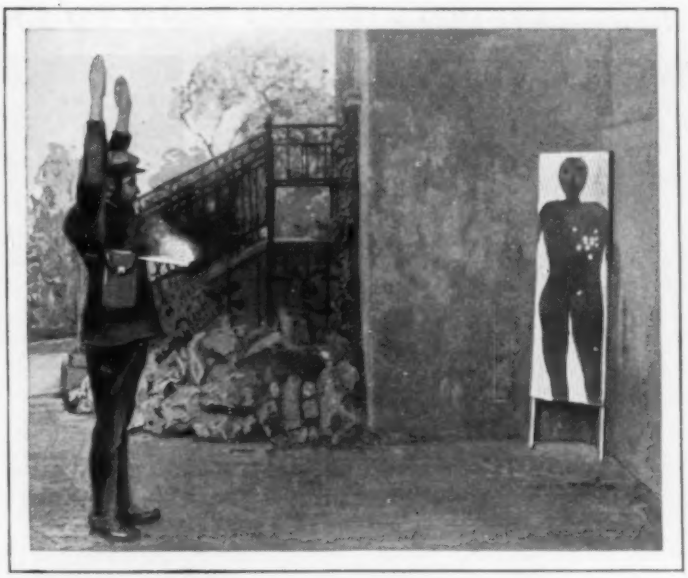
For Centuries, Dolls Have Been the Favorite Playthings of Children in Almost Every Region of the Globe, from Alaska to the African Jungles; Here Are a Few Samples of a World-Wide Collection

Left to Right, Javanese Puppet in Native Dress, Gay French Doll from Nice, France, an Almond-Eyed Pet from Japan, an Italian Beauty and a Veiled Mussulman Lady Doll from Cairo, Egypt

Mrs. W. Kendall Evans and Part of Her Doll "Family" Which She Collected during a Round-the-World Cruise; Chinese Dolls, at Left and Right, Illustrate the Elaborate Care Oriental Craftsmen Lavish on the Tiny Costumes

HUES OF FLOWERS DUE TO SAP

Flowers of the same kind are of different colors largely because the pigment carried in the sap is either dissolved or held in certain specialized cells. Chemical action of the various substances in solution may produce the blue, purple or violet shades, or another group of chemicals may result in orange, red or yellow flowers. It is possible to group all blossoms into two "families," the blue and the yellow, and with each of these are found red and white. In an average collection of 996 plants, 284 were found to have white flowers, 226 yellow, 220 red, 141 blue, 73 violet, 36 green, 12 orange and 4 brown. White flowers were the most fragrant, and the red had a more pleasing odor than the yellow.



Demonstrating Effect of Bandit Gun on Target; Weapon Is Fired by Movement of Hands Upward, to Take Robber by Surprise

RADIO SET ON WHEELBARROW LIGHTENS FARM TASKS

Farmers and commuters in western Pennsylvania have been doing their chores and garden tasks to radio music this season. The set is placed on a wheelbarrow, a temporary aerial erected, if a loop is not used, and an iron pin driven into soft plowed soil for a ground. Daylight-saving schedules in the cities have given impetus to the outdoor radio craze as many farmers would miss the programs entirely unless they tuned in while at work. Dogcarts and small express wagons are also used to carry the sets.

Special Lenses Were Found Useful in Straightening This Chow Puppy's Cross Eyes

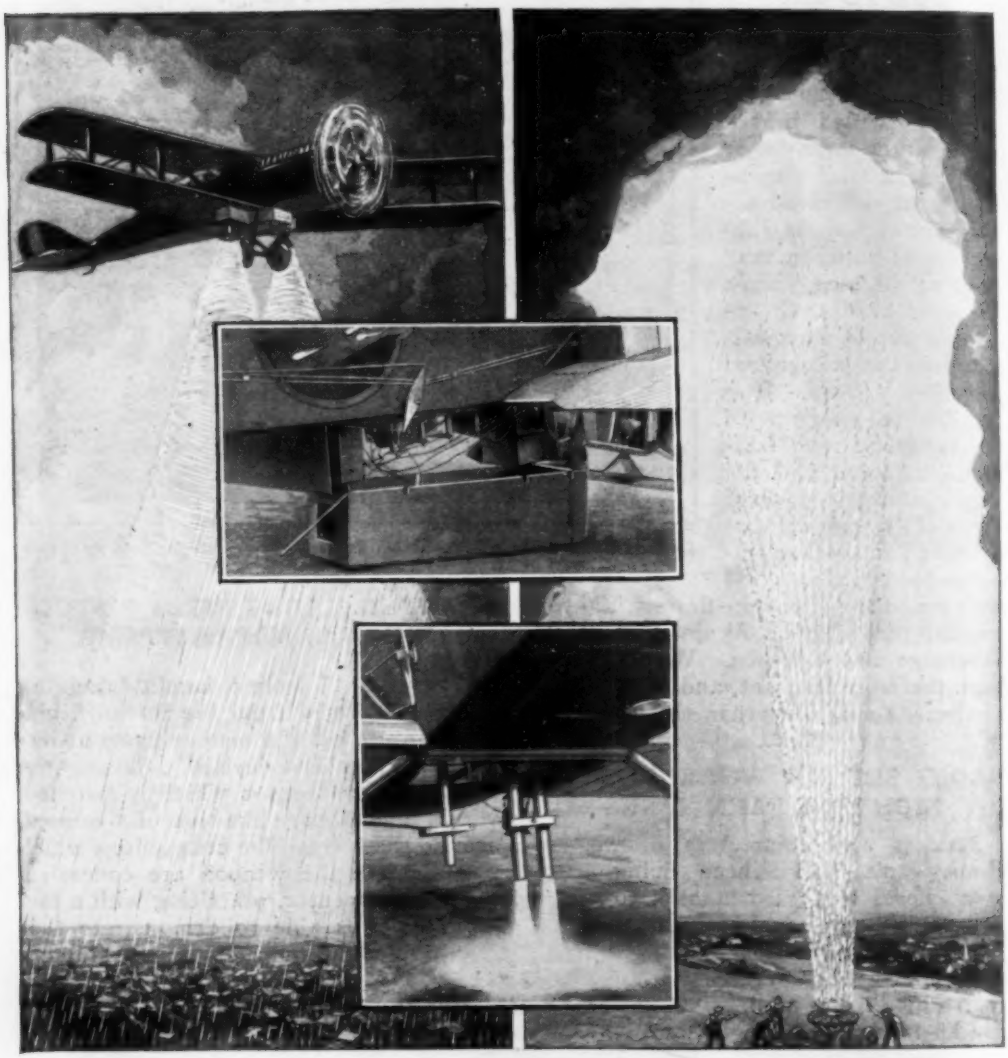
RAISING HANDS FIRES PISTOL WHEN BANDIT ATTACKS

"Hands up!" from a bandit brings an unexpected reply from the intended victim with the aid of a pistol rigging a German inventor has devised. Raising the arms fires the weapon which is fastened, within a small case like that of a camera, around the body. The connections which actuate the weapon are concealed. The inventor, practicing with a target, was able to demonstrate that the arrangement would inflict serious wounds on a bandit.

DOG'S CROSS EYES CURED WITH GLASSES

Glasses with special lenses, which were changed frequently, were fitted to a valuable Chow puppy to straighten its eyes. Several months' treatment were given and the owner is reported to have spent about $300 for the cure.

ELECTRIFIED AIR AND SAND TO END FOG MENACE



Courtesy Army Air Service

Plane Discharging Sand, the Carrier Box and Close View of Nozzles; at the Right, Dissipating a Fog Bank with Electrically Charged Air Forced Upward by Propeller

Annihilation of fog banks and clouds —one of the greatest menaces to aerial navigation — through the discharge of electrically charged air or electrified sand may be achieved through experiments by the naval and army air services. The first tests were made by army pilots using electrified sand discharged through nozzles set in the under portion of the fuselage of the plane. These tests showed that a pathway could be made through clouds at an altitude of 13,000 feet, the atmospheric obstacle being completely disintegrated by the force of the sand particles. A plane capable of discharging 1,000 pounds of sand a minute, it is claimed, would disperse any fog over London, New York or its harbor. The London chamber of commerce estimates the cost of fog to that city at $5,000,000 per day, so that the expense of its dissipation would be almost negligible. The most recent experiments in fog dispersion have been conducted by the navy, but the sand

method was not used. By means of a specially mounted airplane propeller on the ground, electrically charged air was projected in such a fashion as to constitute a curtain of air which precipitated the fog and thus opened a clear path for landings. The successful completion of these important experiments will remove one of the worst hindrances to safe aerial navigation. The field for the use of fog-precipitation apparatus is wide and no doubt will ultimately be used in great cities to lessen traffic jams and other dangers of foggy days, and also in harbors and channels where shipping becomes congested and delayed by reason of fog.

IDOL THIRTY-FIVE FEET TALL UNEARTHED IN FLORIDA

Believed to have belonged to a race that existed 2,000 years ago, a wooden idol, thirty-five feet tall, has been excavated from a burial mound in Florida. The features are apparently those of a female of the Mongolian type and were carved from shells. The body was made of the sea mangrove, or "wood eternal" as it is sometimes called. The mound was discovered about 500 yards from the ocean beach on an elevation not far distant from the location of an early white settlement.

Playing Two Banjos at Once; This Is Possible with the Double-Necked Instrument for Unusual Effects

DOUBLE-NECK BANJO FOR JAZZ PRODUCES NOVEL EFFECTS

Two banjos are practically combined in one in an instrument an eastern orchestra leader has devised to furnish novel effects. The player may alternate from one set of strings to the other or employ a single set. They are strung differently without impairing the quality of the tones.

JOCKEYS TRAIN ON ROLLER-MOUNTED ROCKING-HORSE

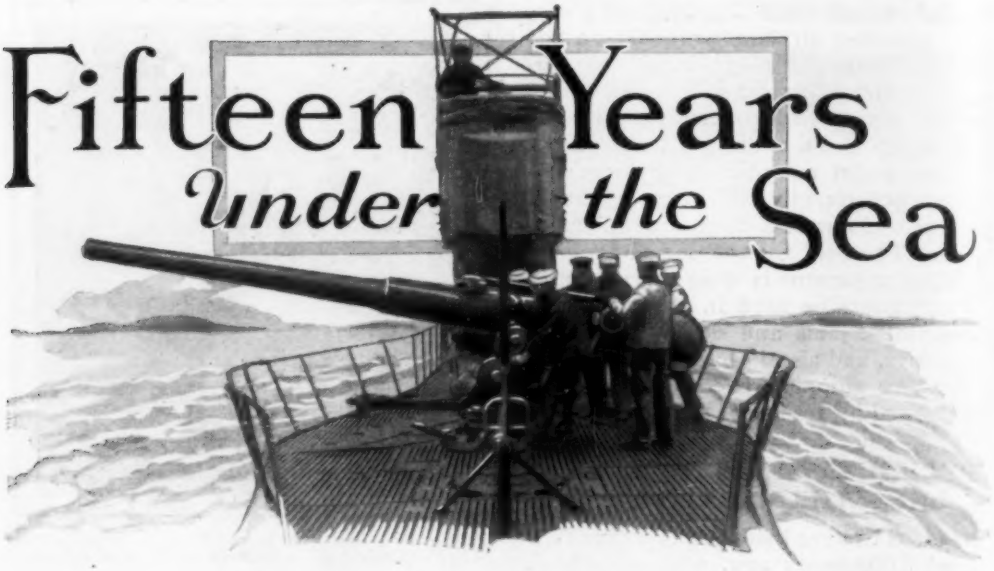
German jockeys ride a wooden rocking horse somewhat like the common toy to help in training for the early-season races. It has rollers on the bottom of the runners so that it makes considerable progress in a forward direction besides the customary rocking motion. It is so balanced that it is not likely to tip over.

¶Many animal trainers declare that tigers are more intelligent than lions.

© Henry Miller

Jockey Riding Wooden Rocking-Horse to Train for Real Races

Fifteen Years Under the Sea



The Story of Capt. Frank T. Cable Who Helped Raise the Submarine from a Little Fish to a Whale

By SAMUEL TAYLOR MOORE

THE head of an electric company in Philadelphia grunted over the letter in his hand. It was a request for assistance from a customer. That crazy inventor at the New Jersey shipyards was in trouble again! His foolish contraption called a submarine boat had flooded and sunk and the electrical equipment had been ruined. He hadn't paid for it either. Nothing to do but send a man up there.

This happened in 1897. The young man selected for the job was named Frank T. Cable. Born on a rocky farm in New Milford, Conn., in the closing days of the Civil war, he had deserted the plow to enter the field of electrical engineering. At the age of thirty-three he was one of the experts in the company's employ.

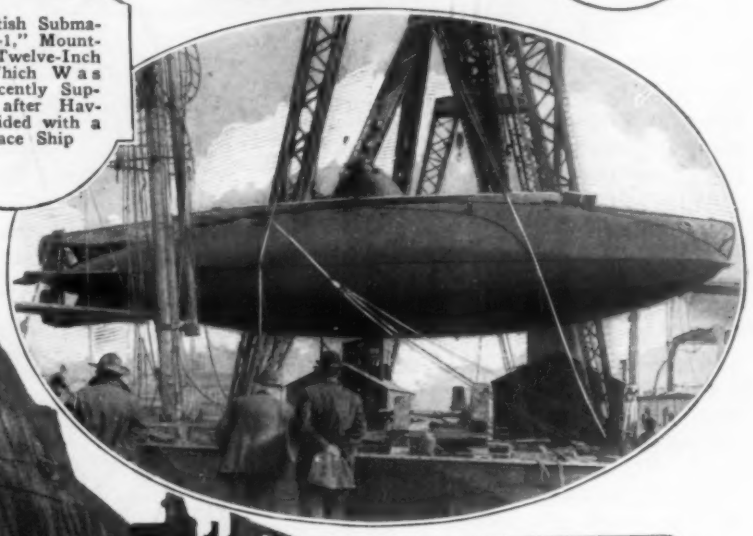
On the ride to Elizabethport the young technician recalled what he had read and heard of the strange experiments of the middle - aged school - teacher - inventor, Holland. Vaguely he recollected a claim that Holland had once remained on the bottom of the Passaic river for twenty-four hours in an underwater canoe. Then he had built two larger boats. A reporter, who had been refused a trip, dubbed one of the craft the "Fenian Ram" because money from the Fenian skirmishing fund had financed the inventor. Weird stories of the subsurface cruises of the boat had been printed in metropolitan newspapers. Both boats were stolen on a dark night by dissenters in the Fenian organization. With inventive persistence, Holland had constructed another undersea craft in conjunction with an American army officer, Lieut. Zalinski. It was wrecked beyond repair at its launching.

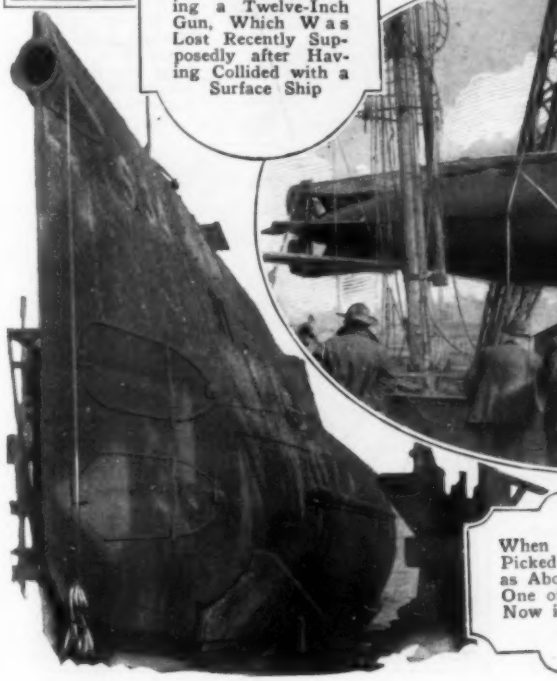
If young Cable wished to remind himself of the utter impracticality of Holland, evidence was available in his failure to complete a contract for the United States government, after the navy department had authorized the building of three submarines. The inventor finished one, the "Plunger," but far from ever navigating beneath the waves, the surface trials even had proved failures. What the muser did not know was that the failure of the "Plunger" was due primarily to official interference and red tape, precluding any possibility of success. He was to learn that lesson by bitter personal experience.

Arrived at the shipyards, Cable solved the immediate problem confronting the submarine builder. In four days the job

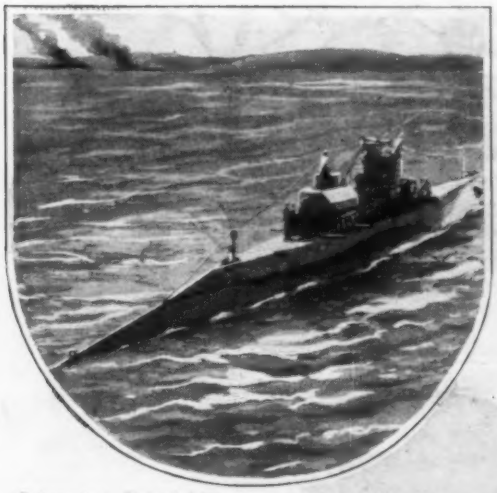
Submarine Built by the Confederate Navy during the Civil War, Now Preserved at a Veterans' Home; Left, John P. Holland, Father of the First Practical "Sub"

The British Submarine "M-1," Mounting a Twelve-Inch Gun, Which Was Lost Recently Supposedly after Having Collided with a Surface Ship





When Submarines Were Little Fish They Could Be Picked Up and Loaded on the Deck of a Warship, as Above; This Was Back in 1908. At the Left Is One of the Big Thousand-Ton Coast-Defense Boats Now in Use, Which Is Less Than Half the Size of a Fleet Submarine



Submarine Dashing Shoreward with Amphibian Tank on Back; When the Sub Goes Down the Tank Proceeds on Its Own Power

Marines Landing Artillery from Armored Boats; Below, the Amphibian Tank as It Appears When It Waddles Ashore

was completed.

Grateful for the efficient aid, the inventor offered the young electrical expert to take a cruise in his weird craft. "Not on your life. You couldn't pay me to go down in that thing," was the answer. Yet six months later Cable was skipper of the "Holland," as the submarine was named.

It came about in this way. Holland, impressed with the capabilities of the younger man, invited him to join his small staff. The salary was more than Cable was receiving. But would it be paid regularly? He had formed a liking for the little Irish dreamer, so he went to his employers. They advised him to accept—for one reason because it would place him in a position to learn what chance the company had of collecting money due and overdue. His old job was always open, he was told.

Young Cable was frankly skeptical when he joined the Holland enterprise. Gradually, during the next two months, every dubious feature of the strange boat emerged in clarity. The doubter was converted. And his enthusiasm for the future of the submarine equaled that of the inventor. What matter if the well-known ghost failed to walk, or even crawl, on pay days! Landlords and grocers had waited before on inventors and promoters. Here was a thing worth experiencing poverty and hardship for.

At sixty years of age, Capt. Cable is today recognized as an international authority on undersea boats. He is one of the greatest submarine-boat builders in the world, with his own shipyard, huge foundries, machine shops and ways sprawling for half a mile along the eastern shore of the Thames river at Groton, Conn. His submarines are serving the navies of the United States, Great Britain,

The Ears of a Submarine, an Electrical Listening Device That Tells the Crew Inside When Other Ships Approach, the Course They Are Sailing and Their Distance from the Hidden Sub

Japan, Chile and Peru. He trained the first subsurface crews of this country, England, Russia and Japan in person.

In the twenty-eight years since Capt. Cable supervised the completion of Holland's egg-shaped submersible, the submarine has made history. It was a Herculean task to overcome naval antagonism and gain a hearing for the merits of the underwater boat. The grim specter of death hovered within the hull more than once. It is a matter of pride with the captain that, in fifteen years of sailing under the sea, never has he been involved in a fatal accident.

Although submarine experiments are recorded as far back as the reign of King James, it was the gasoline motor that made subsurface navigation possible. Like the airplane, the submarine was obliged to wait for the perfection of a compact power plant. The early gasoline engines have been replaced in recent years by heavy-oil engines of the Diesel type, yet a reliable motive unit remains a persistent problem in development.

The original "Holland" survived only through the grace of Providence. Present-day submarines are equipped with three periscopes, commanding vision in all directions and overhead as well. But it was not until 1902 that the periscope was adapted from French submarines. A circle of small oblong ports in the conning tower provided the only means of visibility when the hatches were secured in preparation for a dive. In the busy traffic of New York harbor it was only safe to accomplish brief porpoise plunges. The maiden dive of the "Holland" ended in a mudbank off Staten island, and the skipper and crew held their breaths until the boat was freed by emptying the ballast tanks with compressed air.

To add to complications, war with Spain was impending. The Spanish battleship "Vizcaya" had anchored off New York to retaliate for the presence of the ill-fated "Maine" off Havana. As the "Holland" lacked any official status, it was under close surveillance by naval authorities, who feared that misguided patriotism might lead to the employment of the subsurface craft in some rash act. Pursued by a navy boat on one cruise, the "Holland" eluded its pursuer by hiding behind a barge near Perth Amboy. News of the maneuvers of the weird craft finally reached the ears of the captain of the Spanish battleship and shortly thereafter he weighed anchor and departed.

From the date of Fulton's submarine experiments, which were advanced under the patronage of the great Napoleon more than 100 years before, the most energetic antagonists of the undersea boat were always naval officers. The traditional naval code of respect for an opponent's bravery unified opposition to underwater weapons.

The shadow of tragedy descended on the "Holland" on one of its early trips while naval observers were on board. After a satisfactory demonstration in the harbor, the boat was approaching its dock when the engineer collapsed at his post.

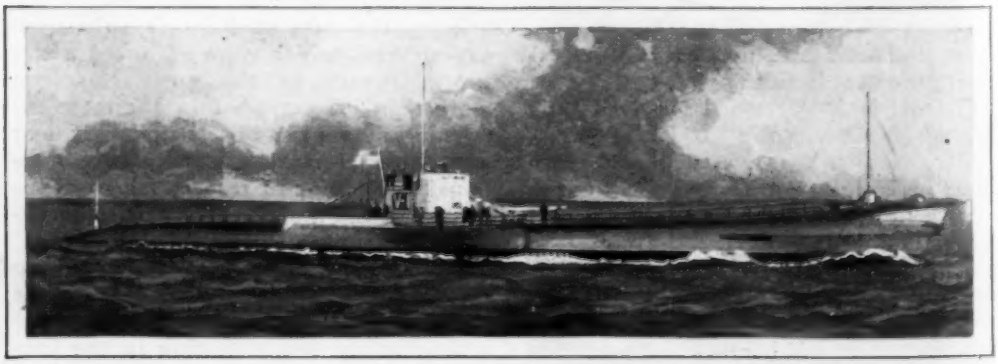
Frank T. Cable, Who Joined the Inventor Holland in the Early Days and Helped Develop the Submarine

Carbon monoxide from the gasoline-engine exhaust was responsible. Two of the crew who rushed to assist the unconscious engineer were likewise overcome. Capt. Cable descended into the hull from his post on the bridge only to be felled by the fumes as the others had been. Would-be rescuers who sought to bring out the limp bodies were in turn stricken down until a total of eight persons were unconscious within the hull. It was four hours later before the last victim was brought back to life after more cautious workers had succeeded in removing the bodies. That incident settled the future of the submarine, observers firmly believed. No chance of tempting any of those men back into a hull that might be saturated with poison at any moment. Yet the following morning every man of the crew reported for duty at the usual hour. As a precaution, however, a cage of mice was carried along in the engine room thereafter, and in all early submarines.

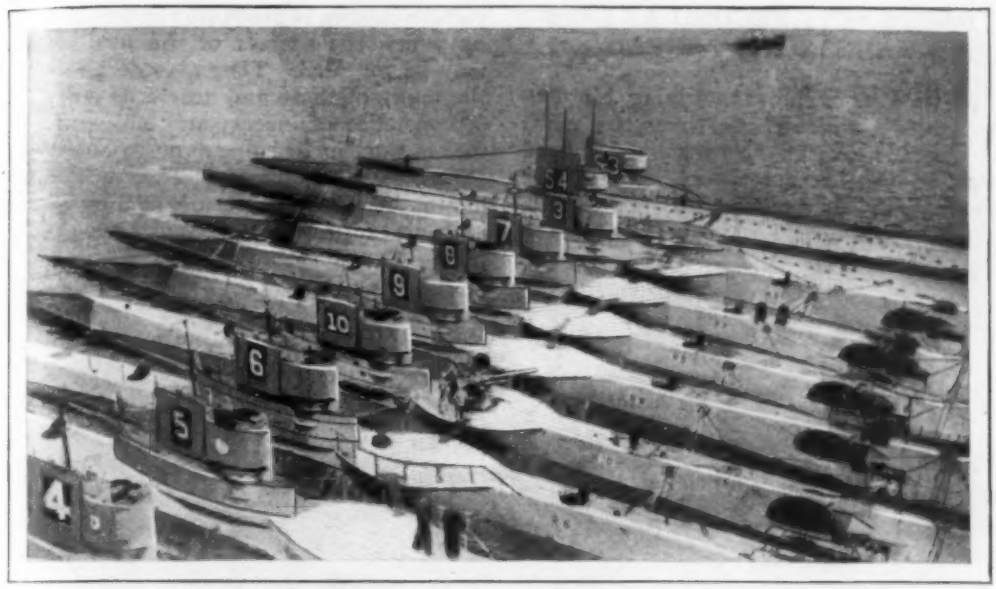
In the first torpedo-firing experiments, thrills in large measure attended. The control of torpedoes, once they left the firing tubes, was an unsolved problem and they dove and ricocheted in all directions. On one occasion the torpedo acted as a boomerang, and after passing through the center of a target, it maneuvered in a wide circle and headed straight back for the craft that fired it. Only expert navigation prevented a collision.

In November, 1898, the "Holland" started on a successful cruise to Washington and later was taken over by the government which ordered six additional boats of the same type. While these were being built, Capt. Cable was supervising the construction of an advanced type of craft, christened the "Fulton," which later was sold to Russia for use against the Japanese navy. After a visit to St. Petersburg to train a Russian crew, he was rushed to Tokyo to help the Japanese launch a submarine campaign. The first Japanese submarine crew was composed entirely of officers. They proved ideal students, but before the new undersea boats were prepared to maneuver, peace was declared.

What of the future of the submarine?



One of America's Biggest Fleet Submarines, the "V-1," Which Recently Established a World's Record by Submerging to a Depth of 220 Feet; on the Surface, It Is as Fast as a Battleship



Flock of American Submarines Tied Up alongside Their Surface Tender, on Board Which the Crews Can Sleep in Comfort When in Port; the Tender Carries Supplies and Makes Emergency Repairs

Prophets have said that the next war may well see capital ships capable of submerging, that a decisive naval encounter may occur in mid-ocean with only a few bubbles rising to the surface to mark heroic events happening below.

Capt. Cable does not share such a vision. He believes that the future will see a reversion to the smaller types of submarines, watchdogs of our coasts. Cost will be one factor. The modern V-type submarine represents an investment of millions. Admitting that the habitability of undersea boats must be improved, he foresees increased speed and efficiency, rather than increased size, as the pre-eminent objectives.

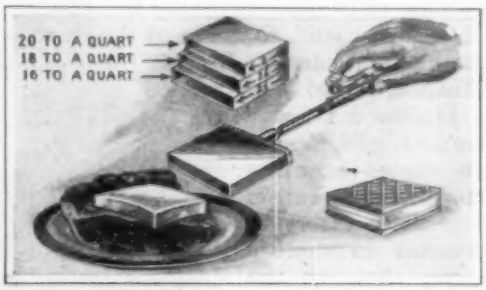
The submarine will not replace the capital ship. Its effect on the surface fleet will be indirect. Huge battleships are comparatively slow, offering an easy target. Light cruisers, small and fleet, are the most difficult targets for a torpedo.

HOW SEEDS BREATHE

Like many human beings, seeds require oxygen in order to grow, and for this reason it is important that the soil in which they are planted be loose and porous. By means of sensitive measuring instruments, scientists have been able to determine the amount of oxygen a seed takes in. The quantity is greatly increased when the seed is on the verge of sprouting. Rice and a kind of California weed will germinate in sealed jars from which the air has been exhausted, if moisture and a sufficiently high temperature are provided.

ICE CREAM MOLDED IN SLICES BY HANDY DISHER

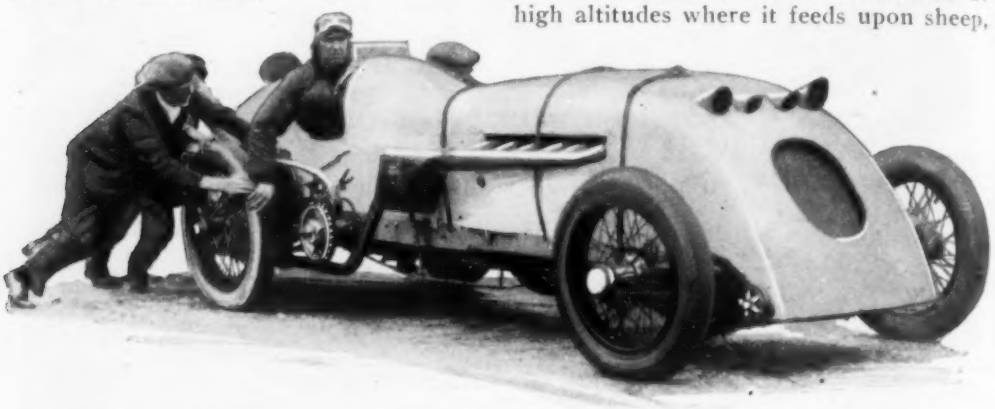
Bulk ice cream is formed into attractive flat cakes for serving on pie, in sandwiches, or other ways, by a disher that reduces waste. It is adjustable to three sizes, to obtain sixteen, eighteen or twenty slices from a quart of cream. The implement is easily used and cleaned.



Disher in Use, and Diagram Showing Different-Sized Slices It Forms for Sandwiches or Pie

RACER SETS RECORD AS LIFE HANGS BY A THREAD

J. G. Parry Thomas, driving his 400-horsepower racer "Babs" over the sands at Pendine, Wales, broke his own speed record when he covered one kilometer at the rate of 171.69 miles an hour. An additional thrill was received at the end of the test. Mechanics found that an offside shock-absorber bolt had worked loose and was held in place by a single thread. This alone probably saved Thomas from death or serious injury.



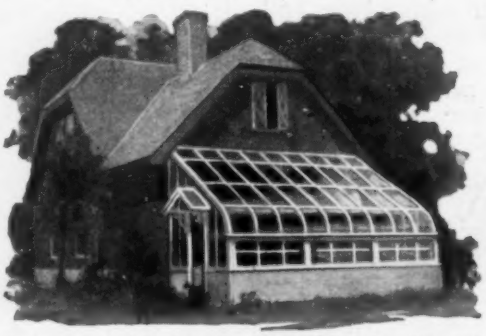
Wheeling Thomas from the Course after the Run; Shortly After the Photo Was Taken, He and His Mechanics Received a Shock; They Discovered a Shock-Absorber Bolt Loose and Hanging by One Thread

THIS INSECT FLIES THIRTEEN MILES A MINUTE

Swifter of flight, perhaps, than any other living creature, the lowly botfly can attain a speed of 815 miles an hour, according to measurements by Dr. Charles H. T. Townsend, formerly of the department of agriculture. It could travel from Washington to San Francisco in four hours. So rapidly do these insects move, that scientists sometimes resort to firearms to capture them, shooting the flies with .22-caliber cartridges loaded with dust shot or fine sand. Naturalists say that the high-speed motion-picture camera is probably the only means by which the secrets of the fly's action may be revealed. They also declare that the study of these and others of the 300,000 varieties of insects may prove of aid to aviation, in learning how to start, fly, steer and land aircraft. The botfly is a mountain climber, often encountered at high altitudes where it feeds upon sheep, deer and moose. In captivity, some often remain inactive in their cages for weeks, while others beat against the walls of their confinement in suicidal desperation.

HOME GREENHOUSE ADDITION EASY TO ERECT

Private conservatories are generally associated with costly and pretentious homes, but an eastern firm has placed a "knock-down" greenhouse on the market sufficiently simple and cheap to be used as an addition to modest dwellings. It is prepared ready for erection, all parts being cut to fit, so far as possible. The outfit includes plant benches with galvanized steel frames and replaceable bottoms, ventilating apparatus and heating coils with fifteen feet of piping to the boiler. Putty, paint, bolts, nails and screws are also furnished. The conservatory can be placed on concrete footings.



Conservatory Added to Dwelling; Parts Are Prepared Ready for Assembly

PLACES DESCRIBED BY VIRGIL FOUND IN ITALY

Explorers in southern Italy are reclaiming scenes described by Virgil and other ancient writers from the borderland of myth. Scholars from the national museum and the university of Naples, in attempting to trace the wanderings of Aeneas, have found that one of the great buildings described in the "Aeneid" was the temple of Apollo, the ruins of which are now being excavated from the acropolis at Cumæ. Virgil tells of a hundred doors that led from the temple to the Sibyl's sanctuary beneath, from which voices issued at her call. Archeologists have dug out fourteen circular shafts, each two feet in diameter and leading from a cave to the temple. They originally were topped with the bronze heads of goddesses through which ran little tubes, terminating at the half-parted lips. This indicates clearly, scholars say, how the alleged voice of the oracle was produced.

NEW HEAT-RESISTING STEEL STANDS TORCH TEST

A steel composite introduced by a western man is said to be so thoroughly resistant to heat that an acetylene torch has little effect on it. A demonstration recently showed that a hole could not be cut in it with the torch, and it resisted also other heat tests.

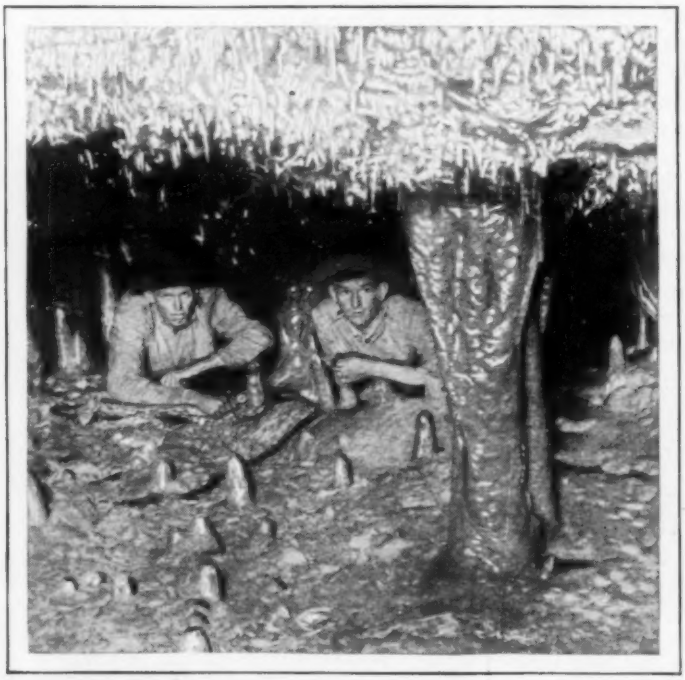
Trying Vainly to Melt the Steel with Torch

If the Child Has Flat Feet, the Ailment Is Plainly Revealed in Reflecting Mirror Below

MIRROR REFLECTOR FOR FEET HELPS FIT SHOES

Both the top and the bottom of the foot can be seen at once with the aid of a reflecting apparatus an eastern physician has devised to aid him in studying pedal ailments of children and others. The subject stands upon a glass beneath which is the mirror, so adjusted that the sole of the foot is plainly visible. Fallen arches and other troubles are revealed by the use of this reflector, and an examination of the feet in this manner helps to determine what kind of shoes would be best for the person to wear.

¶ At no place in Cuba is the sea more than forty miles distant.



© Olympic Jones

Inside Diamond Cave; the Cavern's Beauty Has Delighted Travelers and Many of Its Passages Are Yet to Be Explored

DEPTHS OF BIG DIAMOND CAVE LURE EXPLORERS

Persons with a longing for exploration do not have to journey to the poles for adventure. In many of the large caves of this country are deep, twisting passages that have never yet been visited. Such a cavern is the Diamond cave, thirty miles from the nearest railroad station in the heart of the Ozark mountains. More than twenty miles of its interior have already been explored, and it is said by many to be one of the most beautiful of the large caves of the world. Fantastic shapes, spires and minarets have been formed from the accumulated deposits of drippings.

MYSTERIOUS GAS FOUND ON SUN SOUGHT HERE

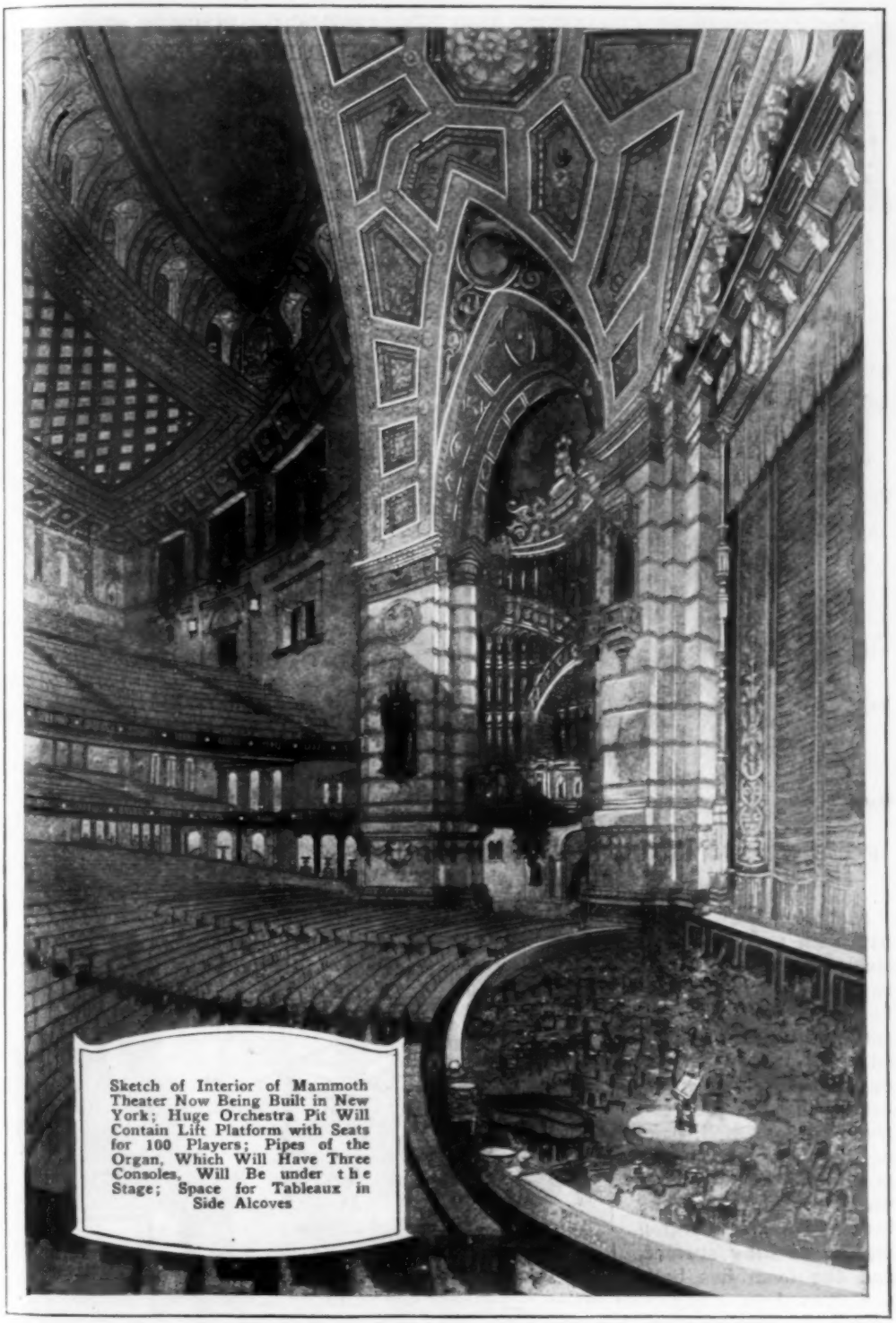
Coronium, one of the gases found in the sun's corona, may have a terrestrial existence, in the opinion of some scientists, although, so far, it has not been discovered in any of the stars. For many years, it was believed to be a new element, but is now thought to be an old one under physical conditions that have not yet been simulated in the laboratories. In that respect, the gas is in somewhat the same status as was helium. This gas was found in the sun nearly sixty years ago, but it took more than a quarter of a century to discover it here. Helium, found in natural gas wells, is now made available for aircraft use by means of improved processes which have reduced its cost from $1,000 to ten cents per cubic foot. It is expected that coronium may be located in the surface of the earth.

Lowering the Roof and Walls of the Snug Garage; Cleats on the Floor Aid in Backing the Car Straight

SMALL-CAR GARAGE HAS SPRING ROOF

For storing small automobiles, such as are used in England and on the continent, a garage with a top adjusted on a spring hinge, saves space and can be opened or closed by a child. The entire top rises or descends somewhat like the door of a mousetrap, and the garage is being made in such numbers that one can be purchased for only a few dollars.

TRIPLE ORGAN FOR SIX-THOUSAND-SEAT THEATER



Sketch of Interior of Mammoth Theater Now Being Built in New York; Huge Orchestra Pit Will Contain Lift Platform with Seats for 100 Players; Pipes of the Organ, Which Will Have Three Consoles, Will Be under the Stage; Space for Tableaux in Side Alcoves

Outfit in Various Arrangements to Show Its Many Possibilities; Note the Fire Shield on Stove

FOLDING STOVE FOR CAMPERS FITS UNDER AUTO SEAT

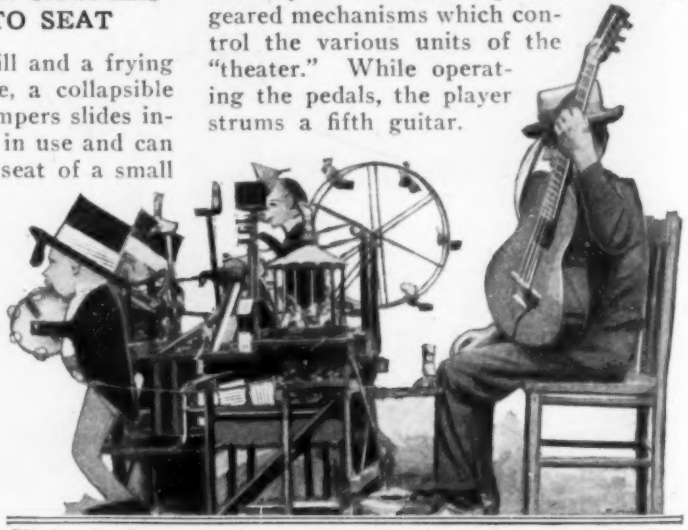
Including an oven, a grill and a frying pan with a folding handle, a collapsible steel cooking outfit for campers slides into a canvas bag when not in use and can be stowed under the rear seat of a small automobile. It is intended for open fires of wood or charcoal, and is so arranged that the cook can fry, percolate, boil, bake or toast foods all at the same time. Windshields on three sides keep the heat and flames directed on the cooking surface, and the oven has been constructed to afford even and effective distribution of heat.

STATIC AIDS FOREST SERVICE IN FIGHT AGAINST FIRES

Static electricity, unpopular with the radio listener, may be "tamed" and set to work as the protector of property. Officials of the United States forest service have found that it has a distinct connection with the relative humidity in the atmosphere, the factor that does much to govern the occurrence and spread of fires. By measurements of the static's intensity and direction, observers are able to forecast periods of low humidity, when fire hazards are greater, and thus be prepared to combat emergencies. Static, the service also reports, gives a clue as to the probable occurrence of thunderstorms from one to twenty-four hours in advance. The importance and value of such warnings are fully realized when it is explained that nearly one-fourth of all forest fires happening in the western parts of the country are caused by lightning.

ONE MAN PLAYS WHOLE BAND AND OPERATES "ACTORS"

To play four guitars, a music box, two sets of bells and two tambourines, besides operating fifteen "actors" who do stunts, a merry-go-round with animated figures and a Ferris wheel with occupants, is said to be easy for a western inventor. It is done by foot and knee power, actuating geared mechanisms which control the various units of the "theater." While operating the pedals, the player strums a fifth guitar.



Playing the Guitar, the Operator Works Pedals and Levers with His Feet and Knees, Causing Model Actors to Perform

CHURCH WHERE WASHINGTON SERVED IS RESTORED

© Harris & Ewing

Where the Father of His Country Served as Vestryman; the Old Falls Church as It Looks Rebuilt

Just as it stood when George Washington and its other vestrymen received it from the builder on Dec. 20, 1769, the Old Falls church, six miles out of Washington, D. C., on the Lee highway, has been restored recently for preservation as another shrine to the first president. The old church is as closely associated with Washington as the bigger edifice at Alexandria, Va., where he usually worshiped, and, in fact, both churches were served in that day by the same minister. The Falls church was first known as the "upper church" and that at Alexandria as the "lower church," probably by reason of their location in relation to the Potomac, river, which was the principal highway of the time.

Records of the parish show a frame church was built on the site in 1734, and on March 28, 1763, the vestry met to decide whether to repair this building or erect another. Present were eight vestrymen, including George Washington, and the two church wardens, and they decided to build a brick church on the same site. James Wren, a descendant of Sir Christopher Wren, the most famous church architect in history, was commissioned to prepare the plans, and the contract was awarded to him at a price equivalent to about $3,000.

In the early part of the eighteenth century the church fell into neglect, as the result of the location of the capital, with its larger churches, near by, but in 1840 it

was restored, and continued active until the Civil war, when it was used first as a hospital and later as a stable for Union cavalry. The soldiers tore out two windows and knocked out the bricks beneath them to make doors for the animals. The recent restoration plainly shows the new bricks put in to fill the gaps.

The interior is plain but dignified, forty by sixty feet, with a height of thirty feet and a plain ceiling. The chancel platform runs the entire width of the building, with a massive white altar in Ionic style, white wainscoting, and, back of the altar, a wall paneled and handsomely carved. The side and front walls are tinted a light tan, and the ceiling is done in ivory white. The two rows of windows have small panes; in the lower row they are rectangular and in the upper finished in half circles. The building, standing in a two-acre plot, is surrounded by ancient trees, which can be seen through the plain windows, giving an effect, according to Archdeacon Neve, "more beautiful than stained glass."

PUNCHES FOR RAILWAY TICKETS REQUIRE MANY DESIGNS

Designing more than 100 different cuts or patterns each year for conductors' ticket punches is the task of an eastern man. The cutting part is an eighth of an inch square and the design must be one that can be duplicated in metal to afford cutting edges. By means of the different-shaped holes in the tickets, auditors are able to identify quickly the various divisions. On one large railroad, each conductor is provided with three punches all with the same symbol, which is never allotted to another conductor on the same road except in case of the death or retirement of the original holder.

BILLION-CANDLEPOWER LIGHT FOR AIRMEN

One of the most powerful beacons in the world has been erected on Mt. Afrique near Dijon, France, to guide aircraft. It is visible for 300 miles, being plainly seen from the British coast, from Brussels, Frankfort and Milan, and is placed at an altitude of about 500 feet.

View of the Lighthouse on Mt. Afrique, Where It Is Visible to Aviators over a Wide Area, and Interior of the Lamp Room, Showing the Reflectors

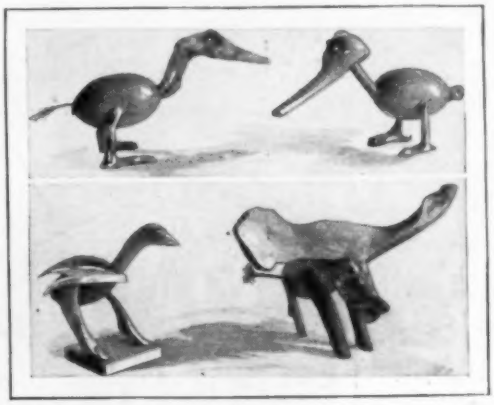
RADIO SAFEGUARD FOR MINERS

Radio assumes the role of protector of miners in an instrument developed for the Pennsylvania fields. It operates in connection with the ventilating system and is intended to ring a bell if dust or gas collects in dangerous quantity. A simple radio circuit is employed, consisting of a variable condenser, a vacuum tube, a sensitive relay and alarm bells. While air passing between the plates of the condenser remains clear, the circuit stays open. But when it becomes filled with dust or gas, the circuit is closed and the alarm rings.

Young Cummings Jumping through a Rope Loop, One of the Favorite Stunts of Experts with the Lariat

ODD DRIFTWOOD FIGURES MADE AS HOBBY

Images of weird beasts and birds are constructed of ocean driftwood as a diversion by a Pacific coast business man who spends many spare hours hunting odds and ends that will fit in with his fantastic designs. Ingenuity is employed in making these images. A beach moose, for instance, has horns made of fish bones, legs of Manzanita wood, while the round body is formed by a fishnet float. One of the driftwood freaks is obviously an ostrich and names for others may be conjured up, although some are difficult to classify. The hobby, however, provides entertainment for its originator and his friends.



Odd Images Fashioned from Bits of Driftwood; Some of the Pieces Require Little Alteration

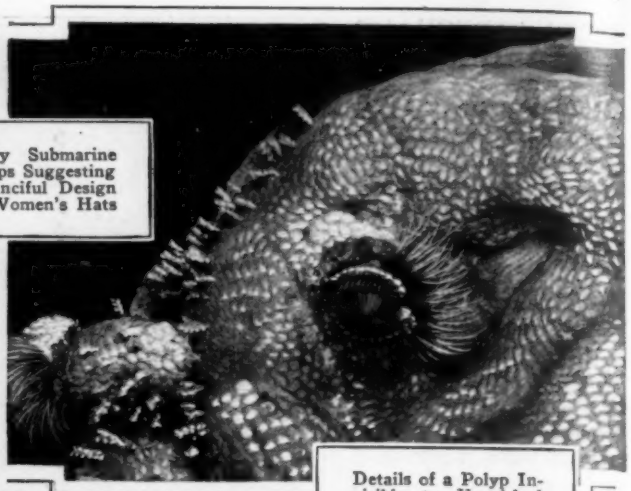
SCHOOL-BOY CHAMPION ROPER AT AGE OF SIXTEEN

Donald Cummings, sixteen-year-old high-school boy of Los Angeles, has become the permanent owner of the William S. Hart roping cup, as he has won the contest three times in succession. He is champion youthful roper of the southwest and adept at stunts that tax the skill of much more expert lariat throwers.

¶ Blossoms for perfume are picked at the time of day when their scent is strongest.

TWO INCHES OF SEA'S BOTTOM AS SEEN UNDER LENS

Tiny Submarine Polyps Suggesting a Fanciful Design for Women's Hats



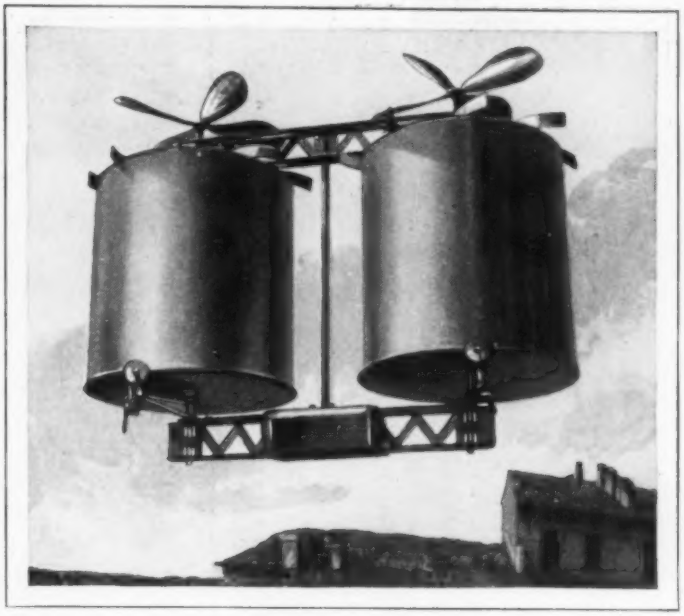
Details of a Polyp Invisible to Unaided Eye, Revealed by Powerful Microscope Magnifying 15,000 Diameters

Above Is a Fraction of a Plot of Sea Bottom, Only Two Inches Square, with Its Weird Flora and Fauna as They Appear under the Large Microscope, and, at Right, the Whole Plot under a Reading Glass; This Intricate Wonderland Was Discovered in a Dead Scallop Shell and Contains, Among Other Things, Tube-Building Worms, Sea Mats and Polyps with Balloonlike Projections Budding from Their Sides; These Eventually Separate from the Parent Polyp and Swim Away; the Original Exhibit from Which These Photographs Were Made Is in the American Museum of Natural History in New York City

Copyright, Herbert Photos

COPPER POISONING POSSIBLE FROM HOME BREW

The increase in bootleg and home-brewed liquors has called attention to the danger of poisoning from copper utensils, according to an eastern authority who points out that some samples contain as much as thirty-two milligrams of copper to the liter. The human system can absorb from five to ten milligrams a day, but beyond that point, there is danger, it is said. A kind of diabetes and other diseases are believed partly due to copper poisoning. In brewing, the organic acids in the mash attack the copper worm of the condenser, when that metal is used, producing a dangerous solution. Similar action may occur when copper utensils are used for ordinary cooking purposes.



Flight of First Rotor Ship of the Air; Cylinders Are Filled with a Buoyant Gas and Revolve in Wind

FLIGHT OF AERIAL ROTOR SHIP LATEST IN AVIATION

Rotating cylinders, similar to those on the rotor ship, have been adapted to aerial use in a model patented by an Italian experimenter. The cylinders use the air currents for propulsion and are filled with gas to give buoyancy.

TINY PHONE FOR DEAF HIDDEN WITHIN THE EAR

Almost entirely concealed, an electric aid for the deaf has no headband, the receiver being worn within the ear and the transmitter hidden under the clothing. About the only part of the apparatus visible when it is in use, is a portion of the small black cord leading to the receiver, most of which is also out of sight but securely held in place. Sound gathering and amplifying chambers in the transmitter, which is only one-fourth of an inch thick, are shaped to prevent distortion of tones.

Phone in Place; the Amplifying Apparatus Is Concealed within the Clothing

WHY WATERFOWL FLOAT

Air retained in the feathers of water birds helps keep them afloat, naturalists have learned. Moisture does not work into the frills because they are so completely oiled that their surfaces do not get wet. Ducks swimming in icy water are kept warm because their body heat is preserved by an almost motionless blanket of air which is retained in the fine meshwork of feathers.

Pedaling Fast But Getting Nowhere; Cyclist Training on Wheel Held Stationary by Rollers

CYCLE RACER TRAINS AT HOME ON TREADMILL

Unfavorable weather does not prevent an English bicycle racer from keeping in training. He has arranged a roller-treadmill apparatus, places his wheel upon it and pedals at speeds of forty-five miles an hour in his home, the rollers keeping the bicycle stationary.

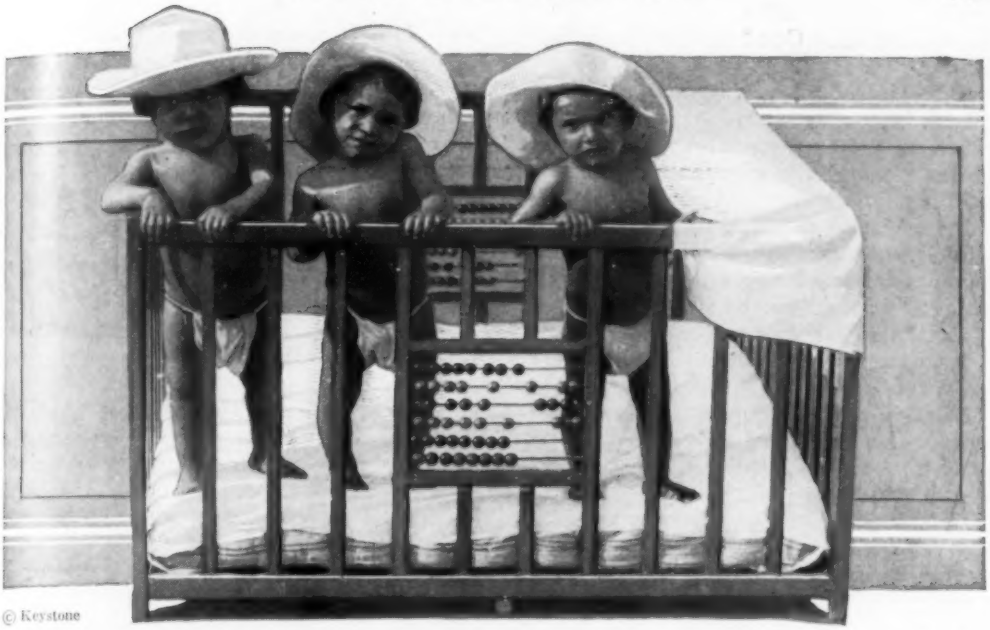
WHEN OCEAN CURRENTS STRAY FISH ARE DESTROYED

Death of half a million oysters has caused alarm among pearl culturists in Japan and may be due to an ocean current straying from its path, scientists believe. Such occurrences, upsetting the balanced plan of nature to which birds and fish adapt themselves, often prove disastrous to man as well as to wild life. In 1925, the warm El Nino current that flows along South America south of the equator wandered far from its usual path, probably due to the weakening of the cool Humboldt current from the Antarctic. Tropical fish invaded the harbors of Chile, and millions of sea fowl that live along the rainless cliffs starved to death because they were deprived of their usual sources of food. Rains fell, sweeping 35,000 tons of valuable guano into the sea and damaging the deposits, while the warm wet spell gave mosquitoes an opportunity to breed in greater numbers and there was a consequent increase in malaria. In 1902, Norwegian fishermen experienced a disastrous season. The cod were small, arrived late and a cod-liver oil famine resulted. Greenland seals and white whales swam as far south as the Shetland islands. The cause was believed to be the failure of the warm current to reach the Arctic seas.

LAWN SPRINKLER ON ROLLER SAVES WETTING SHOES

Especially adapted to watering golf courses or large lawns, a sprinkler attached to a small roller can be pushed or pulled about by the hose so that the attendant does not need to walk in damp grass to change its position. Three nozzles are provided. They revolve in a clockwise direction, the outer ones covering a wide area and a single inner one wetting the grass near the roller.

Sprinkler Nozzles on Cylinder Are Easily Moved by Pulling Hose without Danger of Upsetting Them



© Keystone

Three Young Passengers of the Hospital Ship, Which Cruises off Boston Loaded with Children Who Spend Their Days in the Cold, Open Air, Absorbing Health-Giving Ultraviolet Light

It's as Easy to Add Life to Your Years as Years to Your Life

By HERMAN N. BUNDESEN, M. D.
Commissioner of Health of the City of Chicago

SCIENCE has added another generation to the average man's life, and in the process we have become so accustomed to thinking of our health as something for somebody else to look after that we are beginning to forget our own personal concern in it.

We are told that our lives have been lengthened from fifteen to twenty years and let it go at that. What a lot of us overlook is that the increased length of life is due to the elimination of mass diseases, such as smallpox, yellow fever and diphtheria, that used to wipe out thousands and millions, but that we are still subject to common colds, pneumonia, rheumatism, kidney disease, cancer and other individual complaints. Of what use are the extra years if we are going through them crippled with rheumatism or some other infection?

It is just as easy to add life to your years as it is to add years to your life—and a much pleasanter job. One out of every ten people dies from pneumonia. Few ever need die of that disease, if they eat the proper food, get the right amount of sleep and plenty of sunshine and build up a proper resistance.

We have found out a lot about food in the last few years, and the biggest discovery of all is that the best diet is useless unless accompanied by sunshine, either natural or artificial, or its substitute—cod-liver oil. That has been proved over and over again in the laboratories here and elsewhere. We have fed two cages of rats the same kind of food, kept them in a room where they got only the light diffused through ordinary glass windows, and exposed one cage for a short time each day to the ultraviolet rays from a mercury quartz lamp. The animals in the cage without direct sunlight, despite the best of food and care, languished and died, and those in the cage receiving the artificial sunlight thrived and grew fat. Change the process and give them plenty of artificial sunlight, but take out of their food any one of its essentials, and the rats

droop and die. Good food and plenty of sunlight go together.

Ultraviolet rays, whether from the quartz lamp or natural sunlight, must be taken in moderation, until the skin becomes sufficiently pigmented to resist burning. One minute's exposure under a quartz lamp the first day will cause a slight "sunburn," but the time can gradually be increased day by day as the tan pigment appears in the skin.

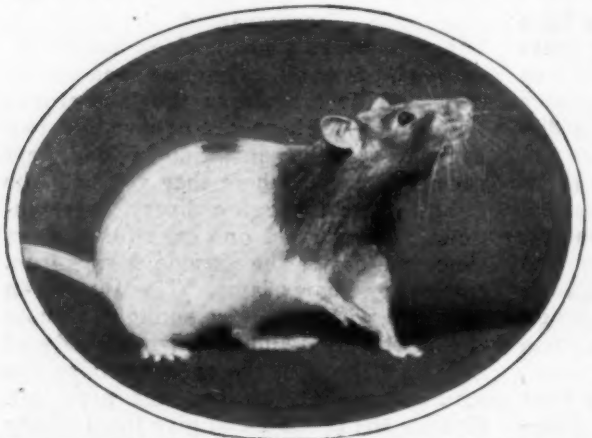
Sunburn from natural sunlight is not only exceedingly painful, but may be harmful. It can be avoided, however, by regulating the burning to produce a slow tan. From fifteen to thirty minutes' exposure is all anyone ought to have the first day. If the clouds are thick, or the air smoky, cutting down the passage of the actinic, or ultraviolet, rays, the time can be increased, of course. If you do get sunburned, the best treatment is cold cream and talcum powder. Use a mild cold cream of the type sold in tubes. Don't use a jar, as it has been exposed to the air and undoubtedly contains growing germs, while the tube type will be sterile. Rub the cream in very slowly, avoiding breaking the skin. Use only a clean towel to rub off the excess cream. Contact with anything unclean, if the skin is broken or peeling, offers an opportunity for infection to get in. Abscesses and virulent sores, and in some cases blood poisoning, are the penalties for failing to observe this caution.

Why do we have common colds and a sharp increase in pneumonia every winter? It is because the sun is so far down to the south that we only get a portion of its ultraviolet rays, and because the pall of smoke over our cities keeps most of even that small part from reaching us. Then is when cod-liver oil comes to the rescue. It is the only known substitute for the ultraviolet ray.

Why do we eat a grapefruit or an orange for breakfast? They, like tomatoes, raspberries, lettuce, lemons and similar foods, are rich in the vitamin C, one of the essentials of a well-balanced diet. Try getting along without your quota of this vitamin and invariably you will develop scurvy. Vitamin A, which is found in milk, cream, ice cream, butter, spinach, eggs and also in cod-liver oil, prevents and cures rickets, malnutrition and bad teeth. We have found in our experiments with rats that if we take vitamin A away, one or more of these diseases appears without fail. Vitamin B, which also occurs in milk, as well as in whole grains, cereals, cabbage, tomatoes, spinach, beans and similar foods, is the one that gives you an appetite.

When a child loses his appetite, it isn't so much because he has been eating candy and sweets, but because he didn't eat his cereal and other foods containing vitamin B. One of the best ways to punish a naughty child, by the way, is to make him eat a plate of ice cream every day. Why? Because often naughtiness can be traced back to some deficiency in diet which has affected his health, and a child with a sick body can't think clearly. Give him ice cream, which contains milk, is rich in vitamins, fat, proteins, sugar and minerals, and you will build up his body and his resistance and give him a healthy mind.

If you give him the right food, plenty of sunshine and fresh air, and the proper amount of sleep, you will build up the bodily resistance which overcomes disease. If the neighbor's child has some contagious disease, the way to keep your child from getting it is not only to keep him away from the quarantined home but to build up his resistance also and thus enable him to defeat the attack of the germs.



One of the Japanese Cape Rats, Which Reached America on a Freighter; They Grow to Ten Inches in Length

© Keystone

What Sunlight Can Do; the Chicken on the Left Didn't Get It, and the One on the Right Did; in the Bottom Picture, the Sickly Chicken Has Been Given Light Treatments; at Right, Weighing a Clinic Baby

A man told me the other day that he caught a cold because he forgot to wear his rubbers, and another said he got the "flu" from his boy who got it from another boy. They were both essentially wrong. The first one caught a cold because he didn't have the bodily resistance to defeat it, the second got the flu from his boy for the same reason. And don't be afraid of drafts. A draft has never killed anybody yet, but fear of them kills tens of thousands. A draft is nothing but good, fresh air, full of life-giving oxygen. The draft doesn't give you a cold, but the bad air before or after you shut the draft off may do so. If you have a family of seven and somebody suggested it was extravagant to have seven individual toothbrushes when you might as well all use one, you would be revolted by the idea. Yet, you will sit around in a tightly closed living room, breathing the air that has been down in six other pairs of lungs and that contains more germs than could cling to any community toothbrush.

Every radiator in my home and office has a humidifier on it, evaporating gallons of water a day. Why? Did you ever stop to think why nature dictated that your thumb should grow just so long and no longer? We don't know, but we do know why she did a number of other things, such as providing that the mucous mem-

brane in your nostrils, and also your lips, should always be moist.

That moisture is there to catch and trap the germs which are floating around everywhere and to keep them out of your system. But in the winter time, if you live in a dry-heated house, the air will take up the moisture from your body and you will begin to crack just as the furniture cracks under the same conditions. The germs lighting on these dry, cracked surfaces find an easy way into your body and you get a cold, if nothing worse.

Out at the American Institute of baking they have been experimenting with the other big factor in health—that of balanced diet—by feeding different foods to groups of rats. Some of them were placed on a diet of potatoes, some on apples, some on spinach, others on cabbage, rice, baked beans, eggs, milk and bread. The rats that ate potatoes lost about a third of their weight and died in twenty-six days. Why? Because potatoes do not contain all of the vitamins. That rats that ate apples lived only fifteen days. A rat on a pure-butter diet, rich in necessary fats but lacking vitamins, lived thirty-seven days but lost about two-thirds of its weight in the process. The rat that ate rice, the principal food of millions in China, lived eighty-five days, while the one that was placed on a cabbage diet lasted but forty days. Eggs, milk and baked beans proved more nearly complete foods and the rats that ate them grew faster and larger than those on an ordinary mixed diet.

In the bread experiments, a rat placed on a diet of white bread made with water died in eighty days, while those that lived on white bread made with milk grew at about the same rate as those on a mixed diet. That shows why milk plays such an important part in the human diet. When the miller turns out white flour he takes away its most important vitamin. Mix it with water for bread and it isn't a complete food, but mix it with milk and you not only get back all the food value the miller took away, but more for good measure.

One more thing about the common cold. Don't take cough medicine to cure a cough. First find out what caused the cough—bad air, poor food, lack of sunlight, the things that weakened your bodily resistance—correct that fault, and then, if you want to, take the cough medicine. You can't cure the cough with cough medicine as long as the original cause persists.

An extra fifteen or twenty years added to your life is pleasant, but put life in those years by keeping yourself so fit that disease can't get you.

¶The temperature of the moon's surface, at its noontime, rises to 250 degrees Fahrenheit, scientists have calculated.

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Scene in a New York Health Center Where Tenement Children Are Taught to Cook Well-Balanced Meals, Which They Then Eat, an Effective Method of Inculcating Diet Lessons

Loaded for a Trip through the Exposition Grounds; Huge Side-Door Auto Truck for Carrying Passengers about the Sesquicentennial in Philadelphia; Conductor Walks through Center Aisle to Collect Fares

ELECTRIC BUS FOR EXPOSITION CARRIES FORTY PERSONS

Visitors at the sesquicentennial exposition in Philadelphia are carried about the grounds in an electric bus with two longitudinal seats, each holding twenty persons. The vehicle is operated by a crew of two men, has a speed of six to eight miles an hour, is over thirty-three and one-half feet long and weighs six tons empty. It is especially fitted to the service because of the ease of getting on and off. To collect the fares, the conductor passes down a center aisle between the seats. A fleet of twenty-five of the busses has been provided for the fair.

GERMAN RADIO FANS PAY FEE FOR LISTENING IN

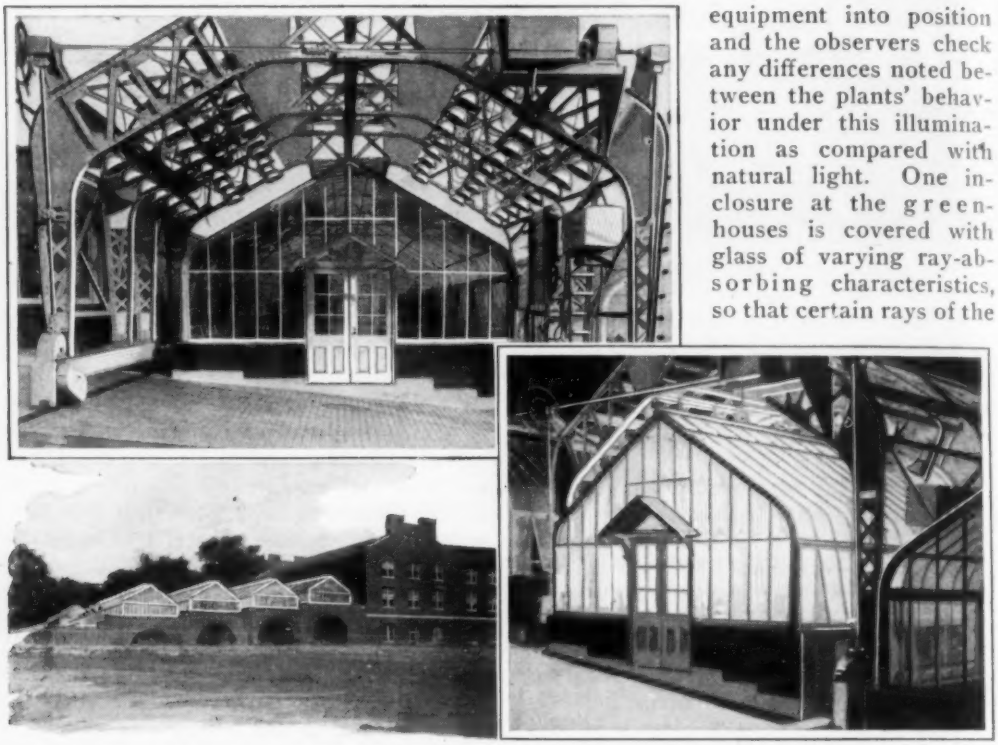
For the privilege of listening to radio programs, Germans pay the letter carrier fifty cents a month and the money goes to the government for the encouragement of broadcasting. If there is a balance, it is applied to the taxes. Owners of receiving sets must have licenses. When a person acquires a set, it is customary to notify the proper official, who places his name on the radio list. More than 1,250,000 names are now on the records. The post-office department owns the majority of the shares of the broadcasting companies and issues the licenses to the private interests that operate them. A general co-operative movement has been accomplished throughout Europe as to assigning wavelengths to prevent interference. A number of large stations in Berlin are all served by a central studio in which three programs can be broadcast simultaneously. One of the compartments is large enough to hold an orchestra of 150 members. Remote control is not favored in Germany, theater and operatic performances being given at the studios. Persons appearing before the microphone are paid for their time, even lecturers from the universities receiving compensation. In addition to this, some of the stations sell time to firms which wish to use radio for direct advertising.

FIFTY SHIRTS IRONED IN HOUR ON IMPROVED PRESSER

Shirt cuffs, neck bands and yokes are ironed at one operation in a time and labor-saving presser especially for laundry use. It is operated in somewhat the same manner as a steam clothes press, the various parts of the garment fitting into different spaces between the leaves. Fifty shirts can be ironed in an hour with this apparatus, the manufacturers assert.

Shirt Ironer in Operation; It Presses Cuffs, Collar Bands and Yokes at a Great Saving in Time

NIGHT TURNED INTO DAY TO MAKE PLANTS GROW



Interior View of Greenhouse, Showing Battery of Lights in Steel Frame; the Laboratories from the Outside, Illustrating Arrangement to Give Full Exposure to Sun, and a Lighted Section

Batteries of electric lights are used extensively in an eastern research laboratory in studying plant growth. The greenhouses are placed to receive the full benefit of the sun's rays during the day and, at night, cranes move the artificial lighting equipment into position and the observers check any differences noted between the plants' behavior under this illumination as compared with natural light. One inclosure at the greenhouses is covered with glass of varying ray-absorbing characteristics, so that certain rays of the sun which are injurious to plant growth may be investigated. Temperature and humidity are automatically controlled in the research rooms, and in a basement contrasts studies are made in two rooms, one absolutely dark and the other lighted.

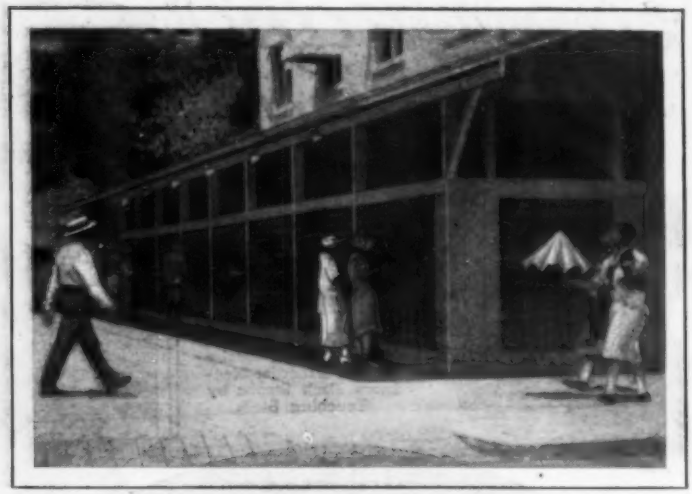
AUTO MATS WITH PADDED SLITS KEEP OUT DUST AND DRAFTS

For the comfort of the small-car driver, slotted floor mats lined with padded material and fitted around the pedals and emergency-brake handle, keep out dust and air currents. They are shaped to fit without alterations, are quickly installed and are not likely to split or become ragged. Besides adding to the appearance of the car and the comfort of the driver they save time and work as cleaning will not be needed as often as without them.

EARTH TREMORS ARE STUDIED TO PREVENT DISASTERS

Study of earthquakes as with a microscope is now being conducted in California to help prevent such damage as occurred in San Francisco in 1906 and in Santa Barbara last year. The seismometer, an improved form of instrument for recording earth tremblings, is one of the aids in this work. It consists chiefly of a pendulum weighing hardly an ounce, attached to a tungsten-steel wire no thicker

than a spider's web. The pendulum carries a small mirror which reflects a pencil of light that registers on a moving photographic film so that a picture of even slight tremors is obtained. By studying their frequency and intensity, a gauge of earthquake activity is afforded which may aid in giving forecasts, just as weather warnings are spread when storms approach. In the opinion of some scientists, earthquake centers are largely located in belts related to zones of growing mountains where there are wide differences in elevation. One belt surrounds the Pacific and another crosses the West Indies. The Carnegie institution is establishing four earthquake-observation stations in southern California.



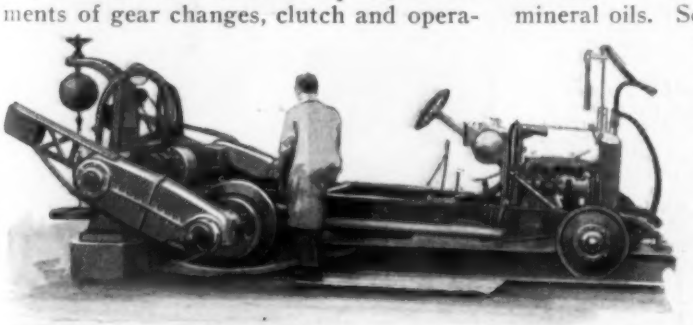
Post Office Lock Boxes in Alley at Miami, Fla., an Innovation Made Necessary by Lack of Space in Main Building

OUTDOOR POST OFFICE IN MIAMI HAS TWO THOUSAND BOXES

Lack of floor space in the Miami, Fla., post office led to the installation of more than 2,000 lock boxes placed outdoors in what formerly was an alley. A wooden shelter affords shade and electric lights set along the eaves illuminate the boxes in the evening.

AUTO TESTED STANDING STILL UNDER ROAD CONDITIONS

To find out how the chassis of an English make of car will perform under actual road conditions, it is run in a special testing unit before leaving the factory. The rear wheels are raised from the ground and the apparatus so loaded that different gradients are reproduced in effect, while measurements are taken of the performance of the chassis as to speed, movements of gear changes, clutch and operation of pedals and brakes. The test is done under the car's engine power and lasts two hours.



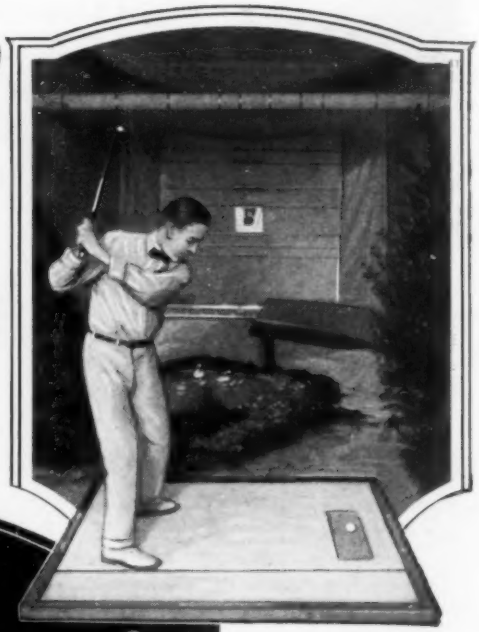
Giving Auto Chassis Road Test, While It Remains Stationary; Performance on Grades Is Easily Checked

PERFUME FROM CRUDE OIL

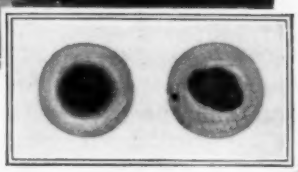
Production of delicate perfumes from ill-smelling petroleum is one of the latest achievements of chemistry. Alcohols which recently have been widely employed as solvents for lacquers and similar substances are also prepared from crude mineral oils. Scientists predict that when petroleum becomes scarce and the remaining supply is wholly used in the manufacture of refined materials, fuel for internal engines may be made from coal and water. By passing steam over a bed of red-hot coal, "water gas" is formed. Conducted at high temperature and pressure over finely divided nickel, copper, iron or other metal, a combination of carbon and hydrogen is formed having high heating value.

Novel and Useful

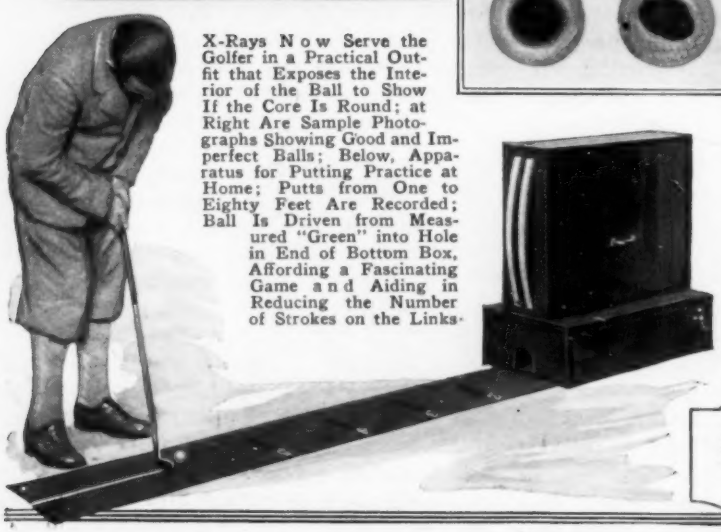
Worn Like a Wrist Watch, Recorder Registers Each Stroke by Touching Stem



Hugh Meehan of Chicago Practicing on His Indoor Golf Course; Entire Equipment Is Quickly Stored Away



X-Rays Now Serve the Golfer in a Practical Outfit that Exposes the Interior of the Ball to Show If the Core Is Round; at Right Are Sample Photographs Showing Good and Imperfect Balls; Below, Apparatus for Putting Practice at Home; Putts from One to Eighty Feet Are Recorded; Ball Is Driven from Measured "Green" into Hole in End of Bottom Box, Affording a Fascinating Game and Aiding in Reducing the Number of Strokes on the Links

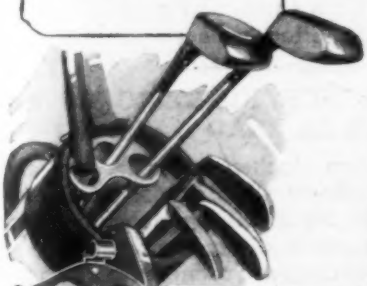


Side-Opening Golf Bag Has Shielded Top and Is Quickly Closed

Things for Golfers

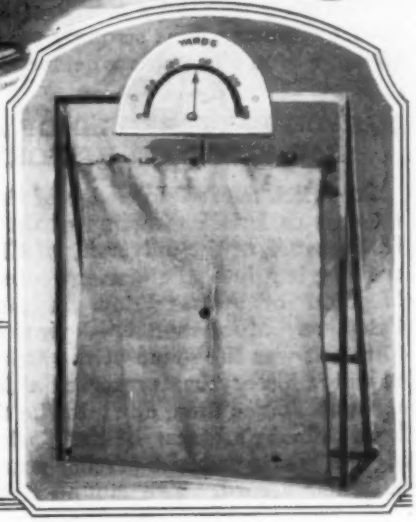
Pencil and Holder Are Easily Inserted in End of Putter for Use in Writing Score

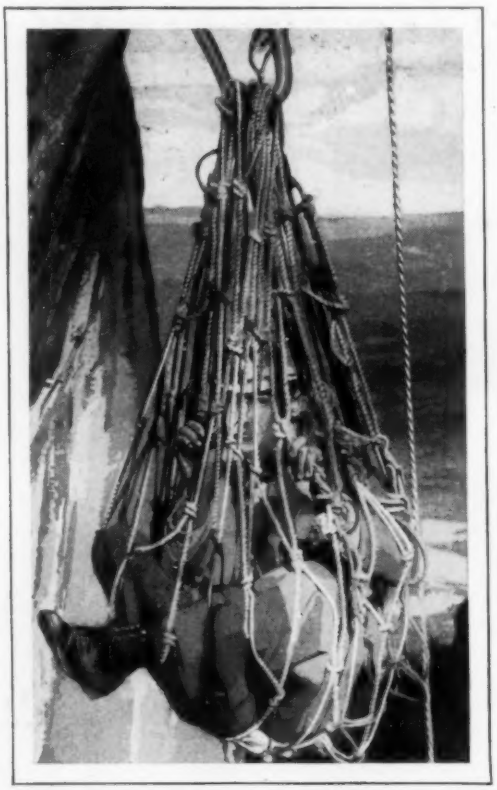
Mold for Repairing Battered Old Balls; with It, You Can Reshape and Mend Spheres at Home



Rack Snapped on Bag Keeps Different Clubs Apart for Quick Selection and, at Right, a Mirror Surrounded by Model Poses of Correct Strokes That Will Help You Improve Form

Arm Guide in Practice Helps Develop Muscles for Accurate Shots; at Right, Screen with Indicator Registers Yardage Equal to Trial Drives Indoors or Outdoors





Nearing the Summit: Passenger in Rope Elevator Used to Lift Persons to Grecian Monastery on High Cliff

ROPE-BASKET ELEVATOR LIFTS VISITORS TO MONASTERY

Persons visiting the monastery of St. Barlaam, near Meteora, Greece, are lifted to the top of the 250-foot cliff on which the building stands by means of a rope-basket elevator. It is strongly constructed and woven like a coarse net for security.

SEARCH BATTLEFIELD OF AGES FOR LIGHT ON HISTORY

To enrich man's knowledge of the past, scholars under the direction of Dr. James H. Breasted, of the university of Chicago, are digging into the ancient mound of Megiddo or Armageddon, in northern Palestine. More than 1,400 years before Christ, it was the scene of the first battle of which history has preserved a detailed account. Since then, down to the time of Lord Allenby's defeat of the Turks during the World war, the passing years have left their record. The mound is a veritable "layer cake" of history, awaiting the scientist's cutting. It was the strategic point of the martial crossroads between Asia and Egypt and, consequently, the battleground of the nations for centuries. Mud-brick walls and other debris from settlements and forts were washed down by rains to form new levels for later structures. This process, repeated again and again, has resulted in a piled storehouse of information, and by digging into the mound, scholars expect to find relics of battles mentioned in the Bible, historical records on stone and may be able to see the relation of one set of objects to the other, as well as the nature and order of events. The only previous work done on the site was by a German expedition nearly twenty years ago. When Dr. Breasted's excavators started, they found the top of the mound growing with wheat which native farmers had planted, but leased it from them, and already a large portion of the top has been removed.

THIRTY-INCH ELECTRIC METER, CAN BE READ A BLOCK

Thirty-two inches in diameter and weighing nearly 100 pounds, an electric meter built for a Chicago substation can be read from a distance of a block or more. It is designed to measure a current of 50,000 kilowatts, each division on the scale representing 1,000. Nearly three months were required to complete the instrument and it was necessary to calibrate the scale by hand. At night, it is illuminated by electric lamps with reflectors.

Huge Electric Meter to Save Steps in Substation, as It Can Be Read from Considerable Distances

Spraying the Chemical on Oil Fire, and Demonstrators in Their Asbestos Suits

FIFTY-THOUSAND-DOLLAR FIRE TESTS NEW EXTINGUISHER

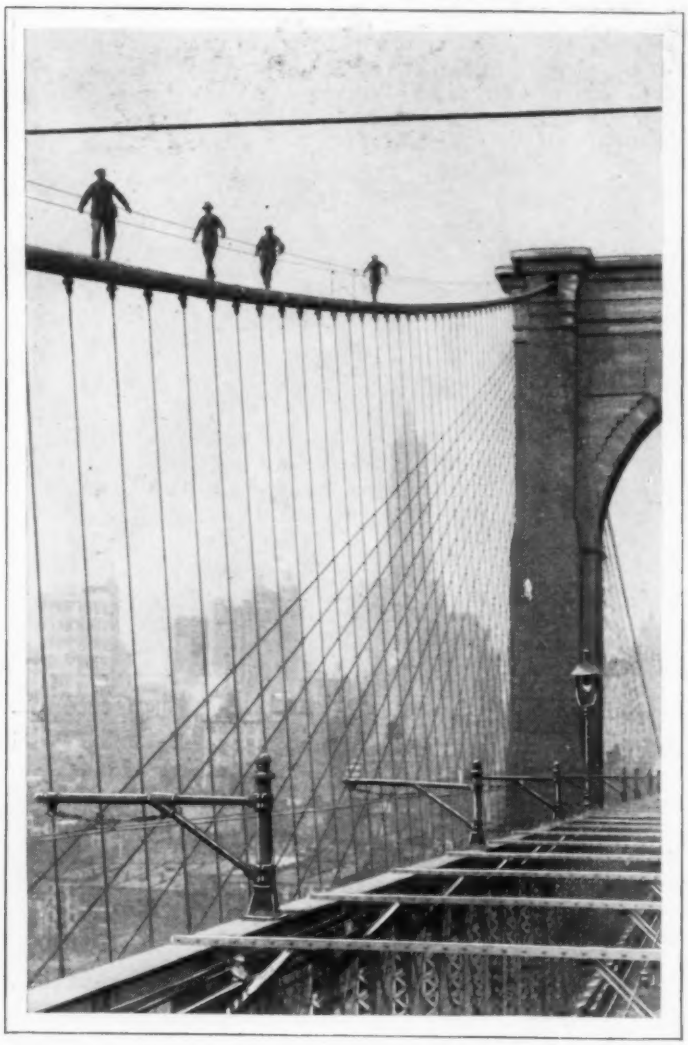
To demonstrate the effectiveness of a chemical process for extinguishing oil fires, a large tank of petroleum was ignited in California recently. Men, dressed in asbestos suits to shield them from the heat, applied the chemicals through hose. The test is reported to have cost $50,000.

ARMORED CABLE TOOL REMOVES POSSIBILITY OF INJURY

To remove the steel covering on armored cable without injuring the conductors or the insulation, a pair of pliers has been patented. The tool will operate on three sizes without adjustment and it eliminates the use of a hacksaw and also the possibility of injuring the wireman or his clothing. It is especially adapted to tight corners. A pair of wide-mouth pliers also is provided in the tool, said to be capable of all the functions of ordinary gas pliers. Heavy leverage is afforded and the cutting blades will sever wire, cable or non-metallic conduit up to half an inch outside diameter.

CLOUD OF WHITE BUTTERFLIES NEARLY HALTS TRAVELERS

Jungles are usually associated with forms of wild life far more dangerous than butterflies, but three travelers in a small automobile were nearly blocked recently, while passing through a densely wooded area in Ceylon, by a cloud of the white and yellow insects. The butterflies descended with smothering impact, producing the sensation of having been struck by a cotton hammer, according to one of the party who described the "attack." The wheels of the auto skidded and with difficulty made headway through the thousands of tiny bodies which covered the car and its occupants, forcing the men to shield their faces. The stifling encounter lasted seven minutes, when the butterfly legions were left behind. Millions of the insects gather in close formations such as this during migrations. Similar occurrences have been reported in this country.



Proving That They Can Qualify as Brooklyn Bridge Cable Painters, Candidates Take the Walking Test Before Being Hired

PAINTERS TAKE CLIMBING TEST TO GET BRIDGE JOB

Applicants for jobs as painters on Brooklyn bridge had to satisfy the New York civil-service commission that they could climb about among the cables before they were accepted. The test, given to prevent needless loss of life through hiring inexperienced persons, eliminated several candidates at the start. Of the first sixteen men who had reported for work, only four made the demonstration climb to prove that they "knew the ropes" and were unsusceptible to dizziness.

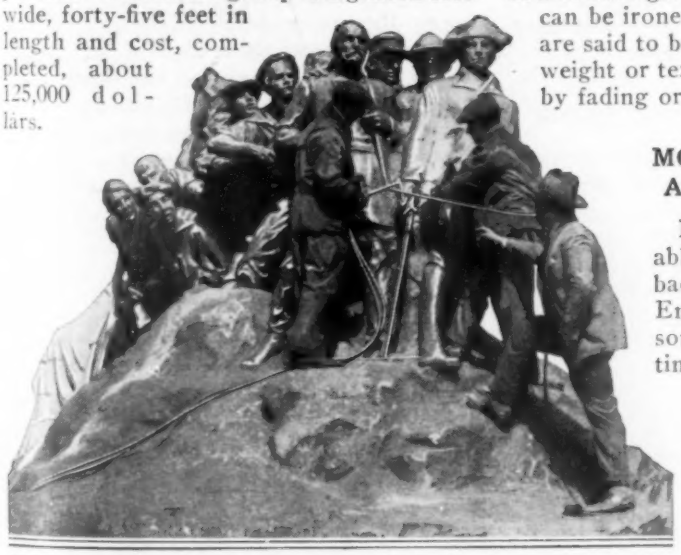
COAL TAR YIELDS THOUSANDS OF COLORS

What is it about one color that makes it "fast" while another fades? To the average purchaser this is one of the unsolved mysteries. The answer lies in the retorts and stills where the tar by-product of the conversion of coal into coke is blended with such substances as salt or alcohol, acids or bleaching powder to produce not only the myriads of chemical dyes, but an even dozen deadly war gases and the elements of four high explosives, besides countless other things. Unlike paints, dyes are not the product of mixing. You can't take a blue dye and a yellow and blend them to get green. Each is the result of a separate process. When a color fails, it may be because the wrong dye was used, or because the wrong kind of material was used. Textiles produced specially for window drapes are dyed with color which will be fast to sunlight, but may not withstand washing. Some of the brilliant chintz patterns adapted for drapes, however, may have been designed for another purpose and dyed fast to washing but not to sustained sunlight. The result is quick fading. The colors which are fast to nearly all the enemies of dye are, unfortunately, the less brilliant series, and mainly those which take well on cotton goods. Cotton is a vegetable fiber and a dye which takes well to it may be entirely unsatisfactory when applied to such an animal fiber as wool, or vice versa. Silk is an animal fiber which may not take the dye that goes on cotton, while artificial silk is a chemical

product which takes the same dyes as cotton or linen, both vegetable-fiber materials. Then there are combinations of cotton and silk, cotton and wool, and others, which must have their own special dyes. Some 10,000 have actually been produced on a laboratory scale, some 3,000 in larger quantities, and virtually 1,000 are available in the form of cheap commercial dye. Some of the tests made to determine the fastness of dyes are quite unusual. Sun exposure and washing can be easily duplicated in the laboratory, but chemists have never been able to reproduce the effect of perspiration, though its chemical composition is well known. One dye maker solved the problem by dyeing cloth and having it made up in shirts, which he presented to locomotive firemen, with the request that they wear them at their work, and then return them to the laboratory for examination.

SOLDIERS OF FOUR U. S. WARS HONORED IN MEMORIAL

Soldiers and sailors who fought for this country in the Revolutionary, Civil, Spanish-American and World wars are honored in a forty-ton monument designed by Gutzon Borglum and erected in Newark, N. J. It was cast in five parts in Florence, Italy, and welded into a unit by a special process. The entire group is eighteen feet wide, forty-five feet in length and cost, completed, about 125,000 dollars.



Welding the Forty-Ton, Four-Wars Memorial into One Piece; the Separate Units Were Cast in Florence, Italy

Ironing over the Flexible Beading without Fear of Crushing or Loosening It

FLEXIBLE BEADING FOR DRESSES IRONED WITHOUT BREAKING

Sparkling beads of many colors for decorating women's garments are being made of a flexible glasslike material so that they can be ironed without breaking. They are said to be adapted to fabrics of any weight or texture and are not damaged by fading or washing.

MOLDED-PAPER PIPE ABSORBS NICOTINE

Light in weight and durable, molded papier-mache tobacco pipes introduced by an Englishman are said to absorb practically all the nicotine as it is produced within the bowl. A specially designed mouthpiece prevents the rest from reaching the smoker's throat. The pipes cost less than the briar variety and bowls and stems can be replaced.

Treating a Sick Parrot in Bird Hospital While Two Fellow "Patients" Look On

WOMAN DOCTOR TREATS BIRDS TO SAVE LIVES OF PETS

Ills to which birds are liable have been studied for the past twenty years by a New York woman who gives the pets medical attention or performs operations on them. Parrots and other kinds of birds often develop sicknesses due to the change in climate and food, and the average owner is little skilled in the proper ways of treating their maladies.

WHERE OCEANS COME FROM

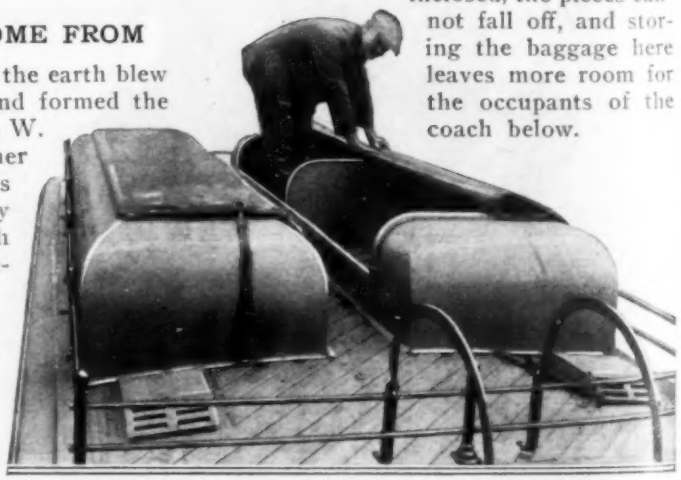
Water imprisoned inside the earth blew off as steam, condensed and formed the seas, in the opinion of Dr. W. J. Humphreys, of the weather bureau. Other scientists are discarding the theory that the center of the earth is a molten mass, and believe that the core may be a solid ball of iron or iron-nickel alloy nearly 4,000 miles thick. The surface crust, one authority estimates, is not over thirty-six miles thick. It is lighter than the interior and may be separated from the core by a fluid or semifluid layer. One scientist holds that the earth was probably once a part of the sun's atmosphere. A passing star, attracting the sun, caused some of its atmosphere to break loose, and on cooling, it formed this planet.

FIFTY SLAVES WORK FOR YOU

Approximately 500,000,000 horsepower are now available from generating plants throughout the country, affording each man, woman and child the equivalent of fifty slaves capable of performing many tasks. The ancient Greek trireme with its ten marines, twenty sailors and 170 rowers was considered an efficient boat in its day, but a single modern vessel such as the airplane carrier "Saratoga" has propelling machinery with power equal to that of 2,000,000 galley slaves and carries 179 officers and 1,695 men. Less than two per cent of the total horsepower developed in 1919 was produced from water. Before 1869, only animal power was used in farming, but today some 20,000,000 mechanical horsepower are employed while animal power has more than doubled.

BAGGAGE HATCH ON COACH TOP SHIELDS GRIPS FROM DUST

Constructed on top of the motor coach, a baggage hatch like that on a steamer keeps the passengers' grips out of the way and protects them from dust. Being inclosed, the pieces cannot fall off, and storing the baggage here leaves more room for the occupants of the coach below.



Baggage Compartments on Top of Motor Coach Have Tight-Fitting Covers to Keep Off Dust and Rain

Flirting with Fate

George Lenke and Hans Benkuhn Shooting Out Lights While Riding Bicycles on a Tight Wire; Lenke Was Killed in a Performance Shortly after This Photograph Was Taken

DO the many folks who daily provide thrills for fair, circus and theater crowds really take any undue risk?

Does the act that holds the gaze of breathless thousands require any great amount of skill, endurance or real daring, or is it merely a clever trick?

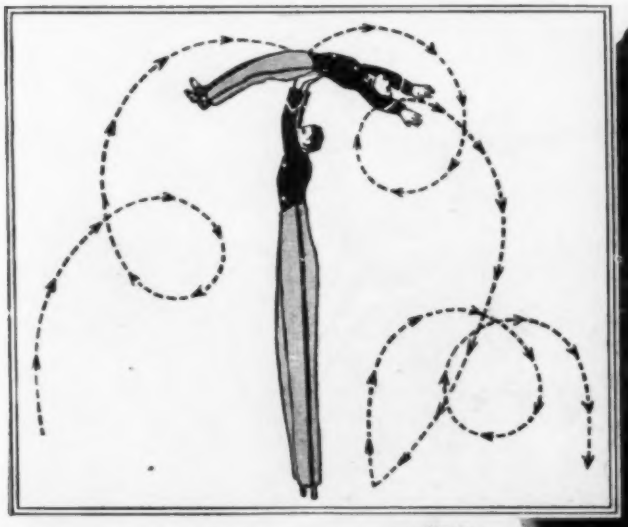
The truth is that most of the feats you see involve an element of very real danger and the penalty for a single mistake in judgment of time or distance, a moment's carelessness or some utterly unforeseen accident, is injury or death.

To be in condition for a performance lasting only a few minutes, many hours of vigorous work are required every day and behind that are years of training, natural talent and cultivated fearlessness. Skilled mechanics build the apparatus used and it is constantly tested and carefully inspected at every performance.

Despite all precautions fate, in the form of some seemingly trivial circumstance, sometimes steps in with tragic results. For instance, one performer, who tells stories while balancing at the top of an unsupported ladder, has had two nasty falls. The first occurred when the electric current failed and the theater was plunged into momentary darkness, causing him to lose his balance and fall on his nose. The second was due to some draperies becoming entangled in his ladder. On this occasion he broke two ribs.

Another comedy acrobat has perfected the art of falling scientifically, which, he explains, consists in taking the shock first with the feet, then with the forearms and finally rolling up into a ball and turning over backward. He places a rickety ladder on an even more rickety table, climbs to the top, and, after swaying perilously for some time, eventually falls backward, a distance of twenty feet. Despite his skill, he was hurt once when his table was placed in the wrong position, causing him, as he rolled over, to strike his head against one of the wings.

According to experienced performers, persons in the audience are incapable of judging which are the most difficult and dangerous feats presented for their entertainment. One of the most wonderful tricks, from an acrobat's point of view, is that of performing a double somersault in the air, jumping from the stage and landing on the feet without the aid of a springboard. Few have succeeded in



accomplishing this, and most of those who have done so have ceased to include it in their acts because it does not draw sufficient applause, the reason being that it is all over before the audience has time to realize what has actually happened.

Acrobat Catch and Throw on Stilts; a Lighted Aerial Act and Daring Horsewoman Training

Among the daring wire walkers are Con Colleano and Jack Delino. Colleano's most thrilling feat consists in performing a forward somersault on a tight wire, and sometimes he exaggerates the danger of this trick by intentionally missing it at the first attempt. Although he gains more applause when he succeeds with the trick, the intentional miss is really the more difficult to perform.

While many performers purposely make intentional misses so that the climax will be better appreciated, there is no opportunity for such innovations on the flying trapezes. One of the reasons for this is that there is danger even in falling into the life net. A landing on the forehead is likely to result in a snapped neck. The net is tightly stretched, its meshes are stiff and if it is not always placed at exactly the same distance below the trapezes, a performer is likely to miscalculate his landing and suffer serious injury. While learning, young acrobats usually are protected with a life belt to which is

Lower Photo Courtesy Sells-Floto

attached a rope fastened to a support overhead so that if they miss a trapeze, they will not fall to the net. After sufficient practice and training in falling, they work for another long period without the belt before they are considered ready for appearance in public.

In the last two years, Mayme Ward, blindfolded and with a sack tied over her head, has made more than 900 leaps from a high platform close to the peak of the "big top" into the hands of her husband, Eddie Ward, who swings from a trapeze forty feet distant. She has missed but about a dozen times although she turns a double somersault while shooting downward. Long practice has enabled her to gauge just how hard to jump.

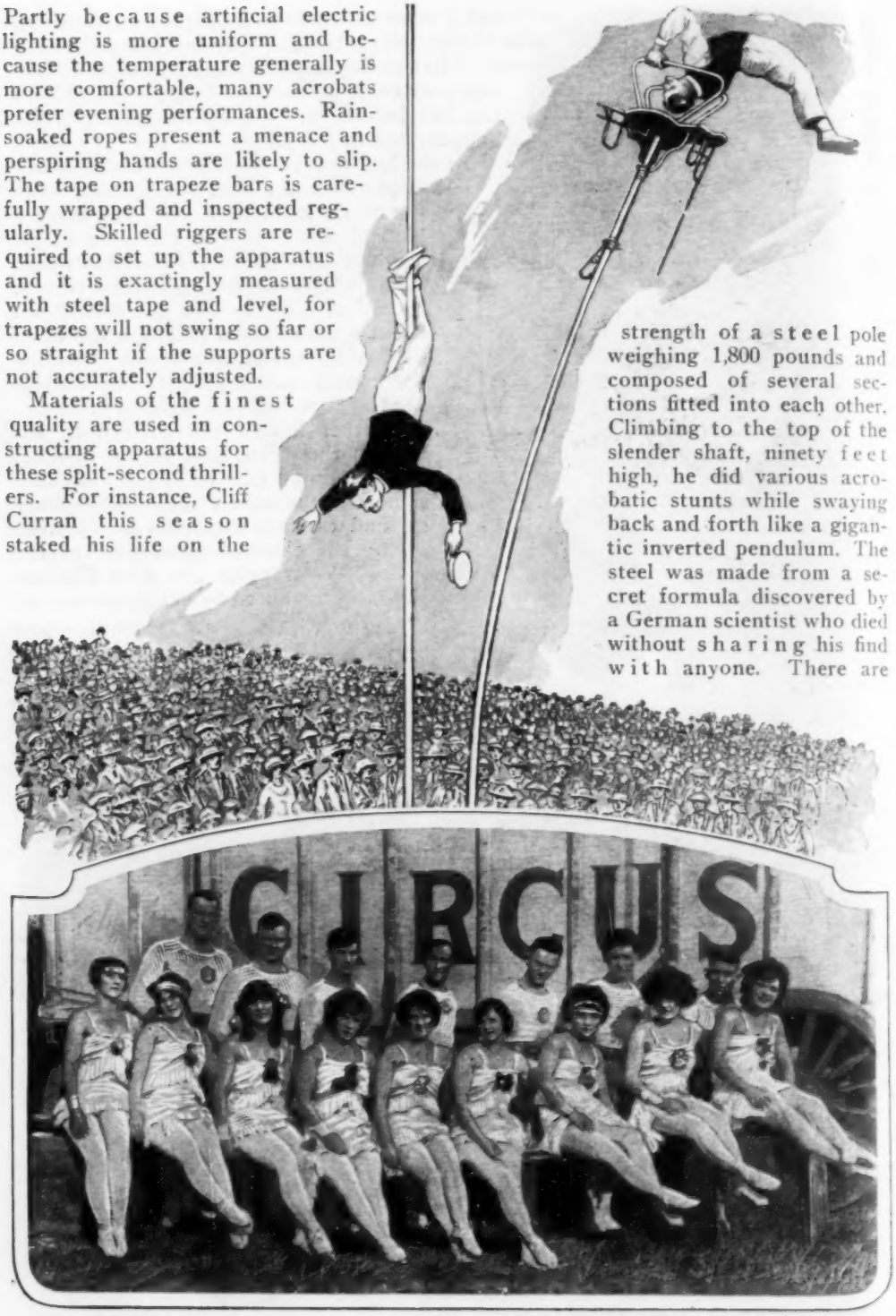
Another hazard not evident to the man in the circus seat is the lighting. One afternoon may be bright with sunshine and the next cloudy. The jumpers and catchers must not be deceived by the changed appearance of the trapezes and the illusions caused by shifting shadows.

Lower Photo Courtesy World Amusement Service Association

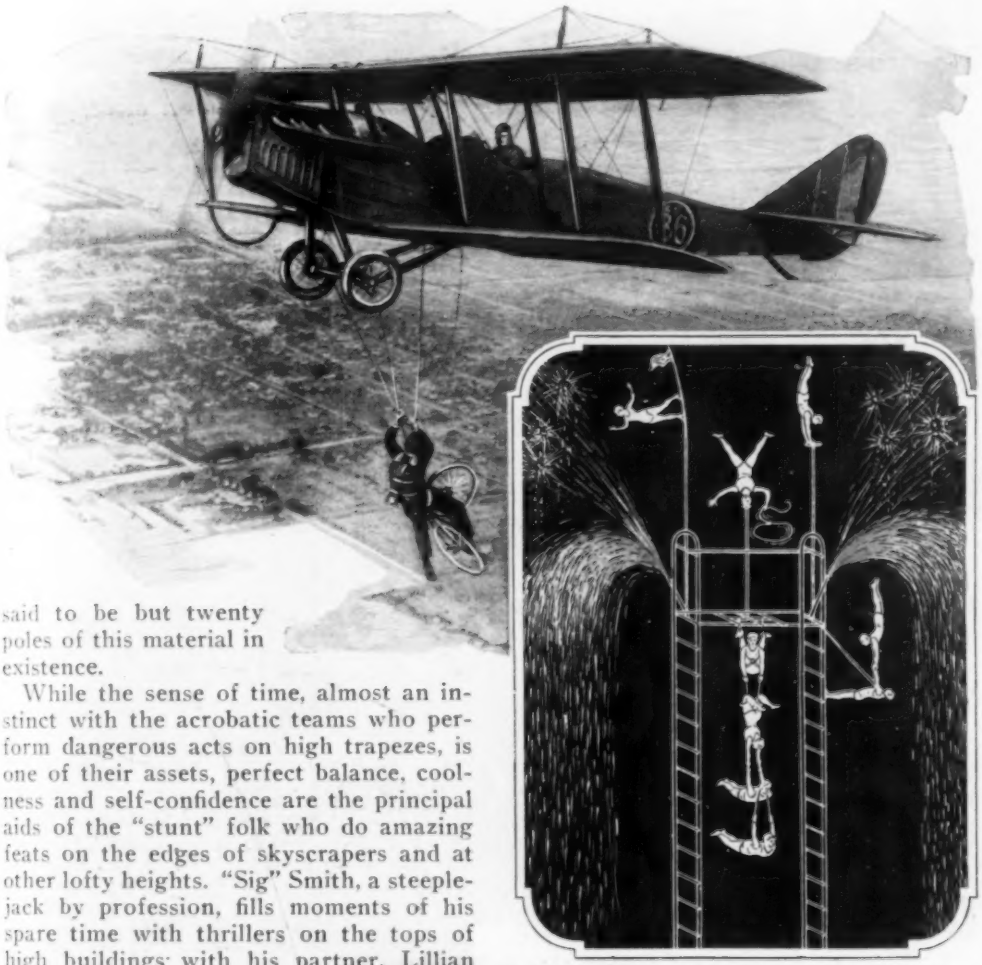
Miss Irma Ward on the Rings and an Exciting Moment in Auto Polo Showing One Car Being Driven over the Other; Steel Hoops Protect Radiator and Motor

Partly because artificial electric lighting is more uniform and because the temperature generally is more comfortable, many acrobats prefer evening performances. Rain-soaked ropes present a menace and perspiring hands are likely to slip. The tape on trapeze bars is carefully wrapped and inspected regularly. Skilled riggers are required to set up the apparatus and it is exactingly measured with steel tape and level, for trapezes will not swing so far or so straight if the supports are not accurately adjusted.

Materials of the finest quality are used in constructing apparatus for these split-second thrillers. For instance, Cliff Curran this season staked his life on the strength of a steel pole weighing 1,800 pounds and composed of several sections fitted into each other. Climbing to the top of the slender shaft, ninety feet high, he did various acrobatic stunts while swaying back and forth like a gigantic inverted pendulum. The steel was made from a secret formula discovered by a German scientist who died without sharing his find with anyone. There are



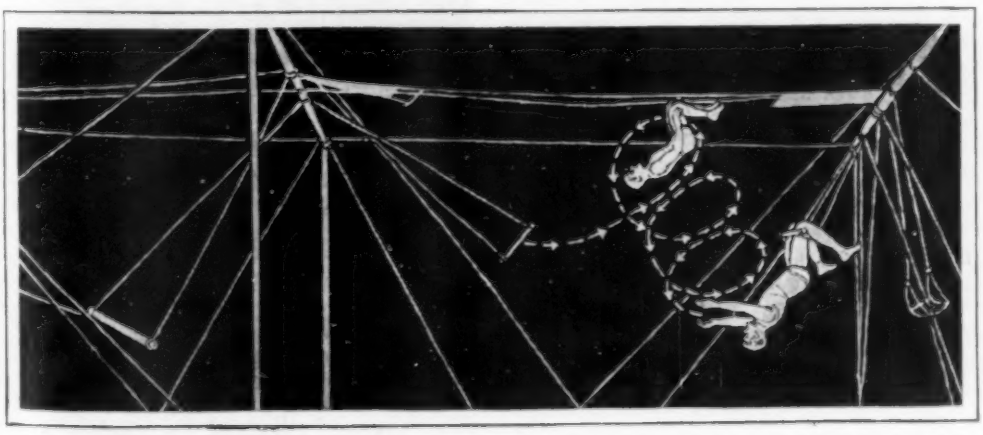
Sketch of Cliff Curran Doing Stunts on Swaying Steel Pole Ninety Feet High; and the Flying Wards, Mrs. Ward Fourth from Left in Front, Mr. Ward Second Standing



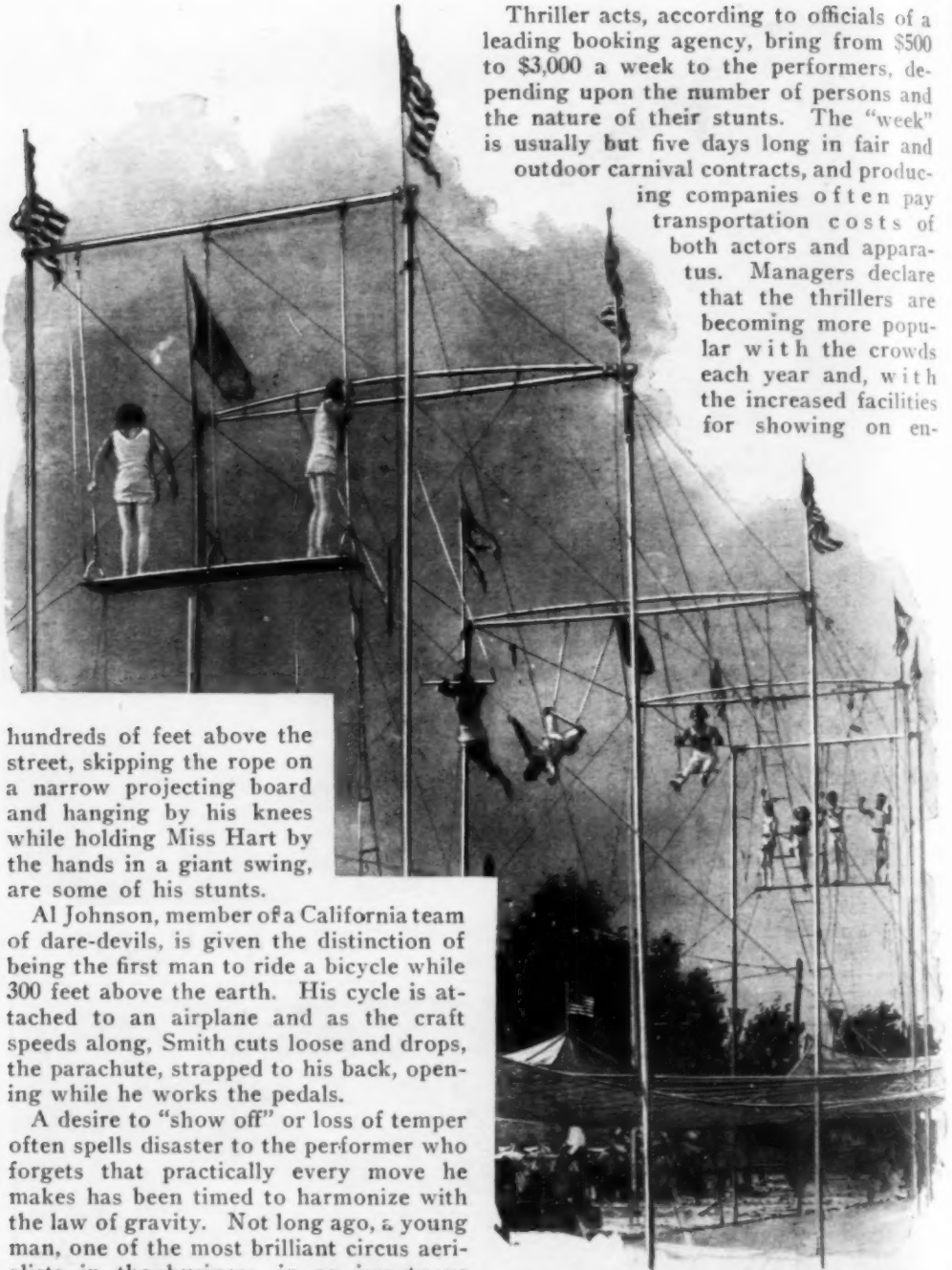
said to be but twenty poles of this material in existence.

While the sense of time, almost an instinct with the acrobatic teams who perform dangerous acts on high trapezes, is one of their assets, perfect balance, coolness and self-confidence are the principal aids of the "stunt" folk who do amazing feats on the edges of skyscrapers and at other lofty heights. "Sig" Smith, a steeplejack by profession, fills moments of his spare time with thrillers on the tops of high buildings with his partner, Lillian Hart. Walking a plank blindfolded while

Al Johnson Ready for Bicycle Parachute Jump from Plane and Sketch of Four Lorenzos' Acts



One of the Thrillers of the Flying Wards; the Jumper, after Leaving the Trapeze, Turns a Triple Somersault in the Air Before the Catcher Grabs Him



A Ward Troupe in an Outdoor Exhibition of Skill and Carefully Timed Teamwork on Flying Trapezes

hundreds of feet above the street, skipping the rope on a narrow projecting board and hanging by his knees while holding Miss Hart by the hands in a giant swing, are some of his stunts.

Al Johnson, member of a California team of dare-devils, is given the distinction of being the first man to ride a bicycle while 300 feet above the earth. His cycle is attached to an airplane and as the craft speeds along, Smith cuts loose and drops, the parachute, strapped to his back, opening while he works the pedals.

A desire to "show off" or loss of temper often spells disaster to the performer who forgets that practically every move he makes has been timed to harmonize with the law of gravity. Not long ago, a young man, one of the most brilliant circus aerialists in the business, in an impetuous moment before his leap to a flying trapeze, jumped violently on the platform. He paid for his instant of anger with his life. A guy rope was loosened, he missed the catcher's hands by the fraction of an inch and broke his neck in the net.

Thriller acts, according to officials of a leading booking agency, bring from $500 to $3,000 a week to the performers, depending upon the number of persons and the nature of their stunts. The "week" is usually but five days long in fair and outdoor carnival contracts, and producing companies often pay transportation costs of both actors and apparatus. Managers declare that the thrillers are becoming more popular with the crowds each year and, with the increased facilities for showing on enlarged theater stages, they are also winning greater approval for indoor programs. There is a constant demand for novelty. Scouts are sent abroad to see

what the foreign producers are offering. One result of this policy this year was "Nathal," a French acrobat disguised as an ape. He climbed tent riggings, grandstand girders and other heights in lifelike imitation of a real monkey.

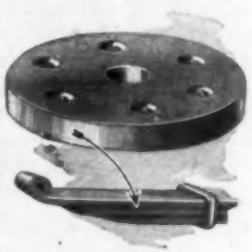
Just as many of the hazards of the acts are not apparent to the audience, so the spectators miss what the performers declare is one of the greatest delights in their work, the opportunity to study and criticize each other. Aerial acrobats, for instance, have little chance to look at the crowds below them, but when they are not flying through the air they are carefully scrutinizing their fellow actors. Most performers encourage this criticism from their associates.

TIME FROM LIGHTING SOCKET LATEST HOME LUXURY

Electric clocks for the home, run by power from the house-lighting circuit and regulated, as are electrically operated timepieces in public places, from a central station, have been introduced in an eastern city. They need no cleaning or oiling, no winding, are noiseless and never run down. Power is supplied from a motor that floats in oil and makes exactly 3,600 revolutions each minute. Through suitable gearing, this is reduced to one revolution per hour for the minute hand and the necessary movement for the hour hand. The clock requires but little current.

AUTO-SPRING SHOCK ABSORBER HAS BALL BEARINGS

Inserted between the leaves of the automobile springs, a series of rubber disks, containing six ball bearings, are said to permit the leaves to slip back and forth practically without friction, thus absorbing the road shocks. The disks are usually put between the front three leaves of the spring, about an inch from the end of each leaf, so that the ball bearings take the load. They are held in position by the rubber.



Setting the Train Indicator; a Turn of the Dials Exposes the Station Names

TRAIN GUIDE SET BY LEVERS SAVES TIME AND ERRORS

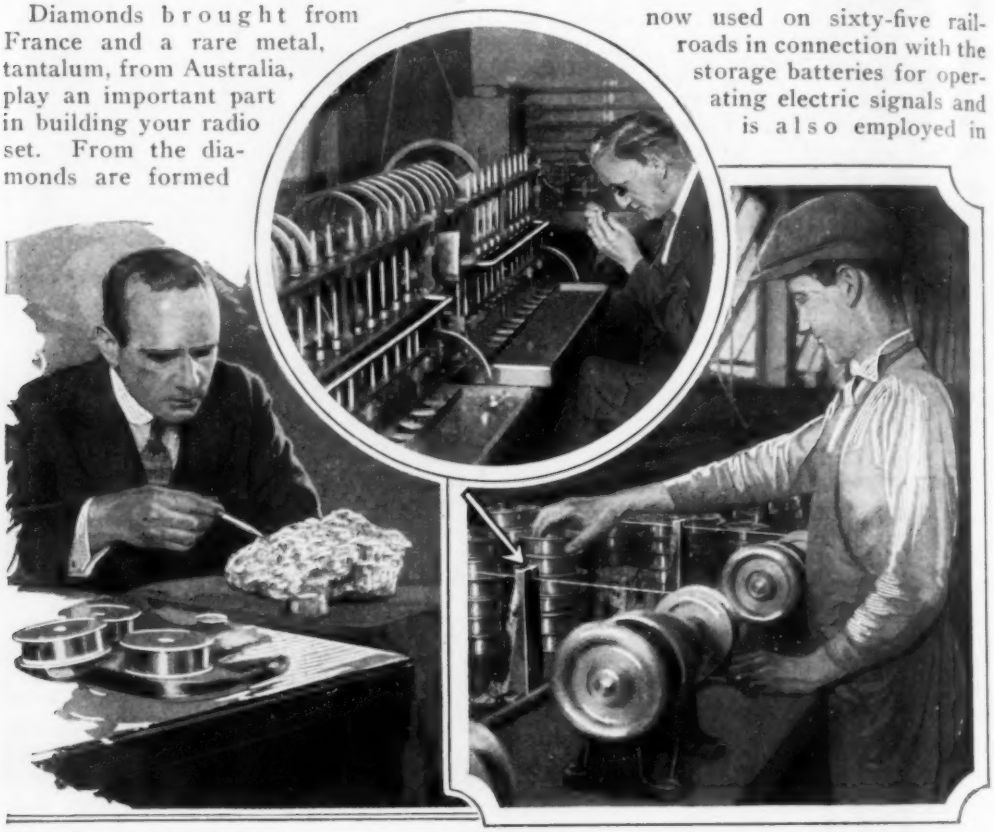
Station names are exposed on a train board now in use on a western railroad simply by touching a series of levers, and track and train numbers as well as time of departure are indicated by turning dials within a control chamber at the side of the board. This arrangement saves time in making a set-up. When the train has gone, the entire board is cleared for another list by pressing a single key. The names are printed on individual turning strips and are visible at a fair distance.

LIME FOR PURIFYING WATER TO SAVE FISH

Lives of millions of fish now being killed annually by acid mine drainage and stream pollution in Pennsylvania, Maryland, West Virginia and Ohio, could be saved by neutralizing the water by a treatment with lime, the bureau of mines reports. Some attempts already have been made in this direction by installing equipment designed to neutralize the free acids in the waste by contact with lime, limestone or marl. Lime is considered the best for this purpose, as it contains less inert material than limestone.

ANCIENT ART HELPS TO IMPROVE YOUR RADIO SET

Diamonds brought from France and a rare metal, tantalum, from Australia, play an important part in building your radio set. From the diamonds are formed the dies through which the fine filament wires are drawn. Tiny holes are punched in the stones by a secret process, developed in Europe some 500 years ago, so that wires as small as four ten-thousandths of an inch in diameter may be manufactured. In a 201A vacuum tube, for instance, the molybdenum filament is so tiny that it would take seventeen miles of it to weigh a pound. Tantalum has two properties that adapt it especially to electrical uses. One is that, when immersed in an acid solution, it will pass electric current in only one direction. The other is that it will absorb many times its volume in gases over a temperature range from red to white heat. This aids in maintaining a proper vacuum within the radio tube. The metal has been adapted to the construction of a type of rectifier now used on sixty-five railroads in connection with the storage batteries for operating electric signals and is also employed in telephone and telegraph signals. This practical application of the metal was the result of the disappointing failure of an experiment. In making the wire, it is essential that the dies be kept polished so that the minute holes will not become ragged. To clean them, ordinary needles are inserted in wooden pegs and placed in the holes. The pegs are then rocked back and forth in a special device, while the dies, several of them being treated at once, turn at 1,400 revolutions per minute.



Courtesy Fansteel Products Co.

Dr. E. W. Engle, Chief Engineer, Examining a Piece of Tantalum Ore; Right, Drawing Wire through a Diamond Die Indicated by Arrow, and Above, the Die Polisher at Work

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¶Soft-coal smoke that pollutes the air of many cities, is an indirect cause of decay in children's teeth, according to an eastern dentist. He explains that the fumes interfere with the sun's ultraviolet rays, and that an insufficiency of these rays makes the teeth of city children decay.

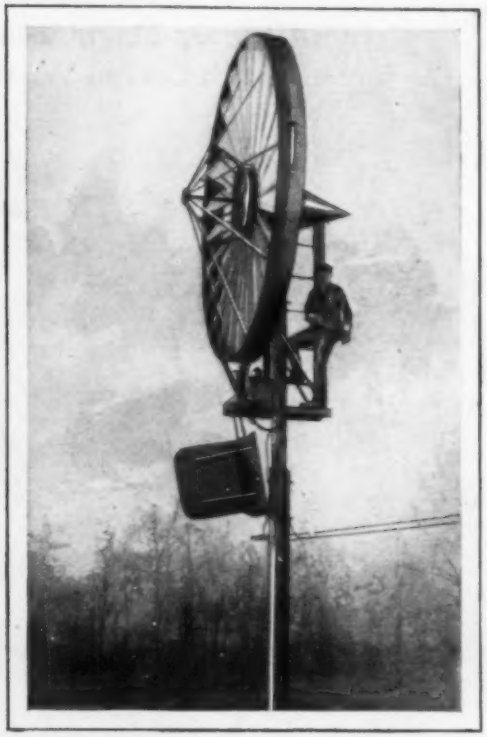
TROPIC HEAT FIFTY MILES UP SCIENTIST BELIEVES

If aviators are ever able to make flights to altitudes of fifty miles, they will be more in need of electric fans than electrically heated suits, in the opinion of Prof. H. H. Turner of Oxford university. On the basis of observations made on meteors, when they first become visible after entering the atmosphere from outside space, he has drawn the conclusion that the temperature fifty miles or so from the earth's surface is warm or actually tropical. Unmanned pilot balloons have been sent up to heights of about twenty miles, but the knowledge of the upper air has been greatly extended by the study of "shooting stars."

SEARCHLIGHT AS BANDIT ALARM AIDS POLICE AND CITIZENS

Having been "retired" after many years of service in the U. S. navy, a 43,000,000-candlepower searchlight has been adapted to new duties as a robber alarm. It is mounted on top of a hotel in a Massachusetts city, and when word of bandits or burglars is received at night, its beams flash a signal visible for many miles, to put citizens on their guard and warn police to look out for suspicious persons.

Powerful Searchlight Mounted on Building Top as Means of Spreading Bandit-Alarm Signal



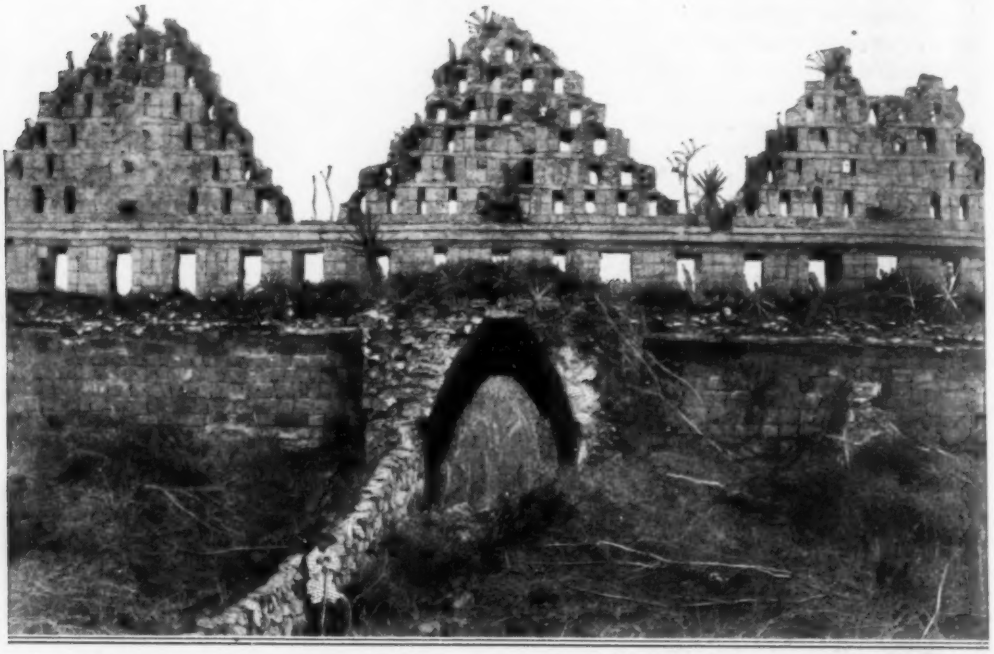
Indiana Farmer's Homemade Windmill Plant Which Generates Current for Lighting and Power

WIND-DRIVEN ELECTRIC PLANT CAN SUPPLY THREE HOMES

Electricity for three farmhouses is supplied by a homemade, wind-driven generator an Indiana man has constructed. A drivewheel, twelve and one-half feet in diameter, is connected to a generator by a belt, both being supported by a single gas pipe, twenty-one feet above the ground and seven feet below, anchored in concrete. Features of the plant are its oiling system, which needs attention only about once a year, and a cone extending from the center of the wheel to keep the force of the wind within the circumference of the driver. Twenty-four propeller blades are pivoted on one side and held with coil springs, so that, if the wind becomes too strong, the blades will straighten out, allowing the blast to pass through and preventing damage. A regulator controls the amount of electricity produced according to the velocity of the wind. Current is stored in a large battery which meets the requirement of lighting and other purposes for two weeks.

Lost World Is Found in Yucatan Jungles

Explorers Uncover Magnificent Ruins of Temples and Palaces Covered with Carved Writing Rivaling Ancient Culture



View of the Palace of Uxmal, Supposedly the Home of the Ancient Kings of Yucatan; Note the Pyramidal Opening in the Wall; the Ancient Americans Never Solved the Secret of an Arched Opening

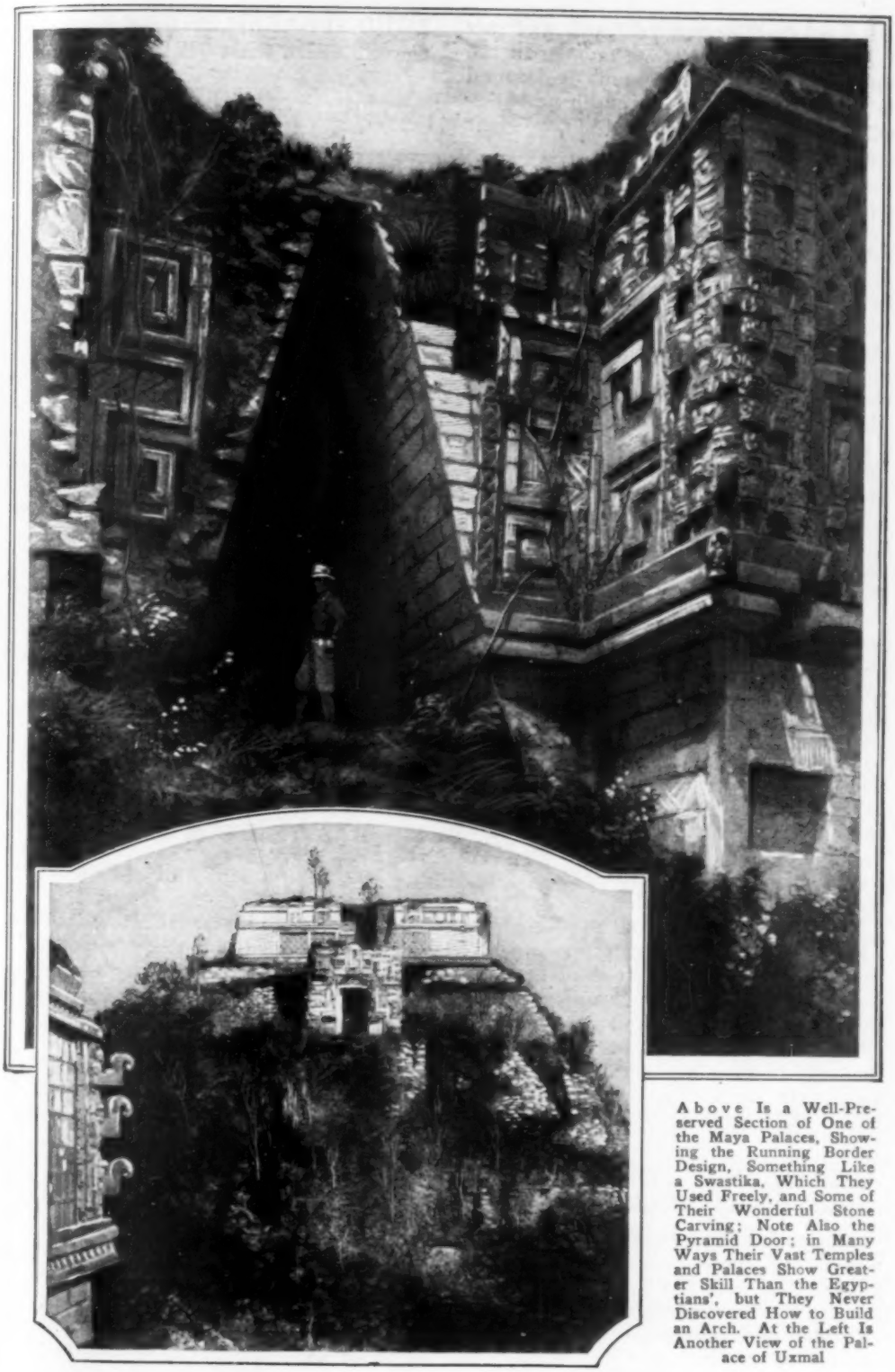
TRACES of a lost and forgotten world in which there flourished, centuries before Columbus discovered America, a civilization that rivaled that of ancient Egypt have been uncovered in Yucatan, one of Mexico's tropical provinces, by the Mason-Spindler expedition from Harvard university.

Magnificent temples, ancient walled cities and vast palaces of the Maya kings were found in the heart of the jungles, adding another chapter to the story already partially learned in ruins earlier discovered in Yucatan, British Honduras and Guatemala, where the cities of Palenque, Tikal, Naranjo, Copan and Quiriqua have been explored.

The new ruins abound in geometrical designs and beautiful carvings, but like all other Maya buildings, possess no arches—an architectural trick which they never mastered. Instead, their huge doorways either were built up in the form of pyramids, or with straight sides capped by a gigantic stone piece. How they were able to carve out and move the enormous stones remains as great a mystery as the building of the pyramids in Egypt. The blocks were perfectly matched and laid without the use of mortar.

The history of the Maya civilization remains one of the most fascinating enigmas known to man. Developing in South America, their empire attained a high degree of civilization; then, for some unknown reason, they left their cities and moved northward into Central America and lower Mexico. The time of the migration has been definitely placed at about 200 A.D., and during the next four hundred years they built their cities in Honduras and Guatemala. None of the inscriptions found on the monuments in this district bears a date later than 600 A.D., but the new finds in Yucatan are expected to bring the story down several hundred years, possibly to the time of the first Spanish conquistadores.

When Hernandez de Cordoba's three caravels came in sight of the flat sandy



Above Is a Well-Preserved Section of One of the Maya Palaces, Showing the Running Border Design, Something Like a Swastika, Which They Used Freely, and Some of Their Wonderful Stone Carving; Note Also the Pyramid Door; in Many Ways Their Vast Temples and Palaces Show Greater Skill Than the Egyptians', but They Never Discovered How to Build an Arch. At the Left Is Another View of the Palace of Uxmal

shore of the Yucatan peninsula and saw the brilliantly white stone temples of the first real city the Europeans had found in America, the Maya strength undoubtedly had already begun to decline. Their wealth of gold and precious stones excited the Spanish invaders, and in the resulting wars all of the leading caste of the Mayas were wiped out and only the dullards left, and it is from these that the present Maya tribes, who have reverted to the lowest form of life, have come.

For many years there have been rumors in Yucatan that somewhere in the interior of the jungle there still exists a city, called Iximaya, inhabited by the last remnants of the powerful Mayas, but no one has ever seen it, and come back to tell the tale. Two Americans who went in search of the city several years ago never returned. The native rumors, however, describe the city as being surrounded by a wall four miles in length, inclosing vast temples and altars to the sun.

The Maya ruins abound in hieroglyphs which bear a very close resemblance to the Assyrian, their divisions of time and numbers are virtually the same, and even the holidays they observed are quite similar, which gives basis for the belief that the original culture might have come over an ancient land bridge with Europe—the fabled lost continent of Atlantis.

CIGARET BOX FOR SWIMMERS HOLDS MATCHES AND KEYS

Strapped to the swimming-suit belt, a waterproof cigaret case also has space for matches, or with the rack removed, may be used for jewelry, keys or other articles. A rubber-lined spring top fits down tightly to keep out moisture.

LOUD-SPEAKER PHONE SYSTEM SPEEDS CAR SWITCHING

"Car 10176 coming on track fourteen. Let 'er go on track three instead." The order booms out of a loud speaker in the signal tower man's loft in the Illinois Central freight yards near Chicago. Without leaving his levers to answer the phone, the tower man can execute the command which was given by the switching "hump" foreman. His office is connected to eleven towers disposed throughout the yards and the orders are heard simultaneously in each. He speaks through a microphone such as is used in radio and his voice is amplified through vacuum tubes.

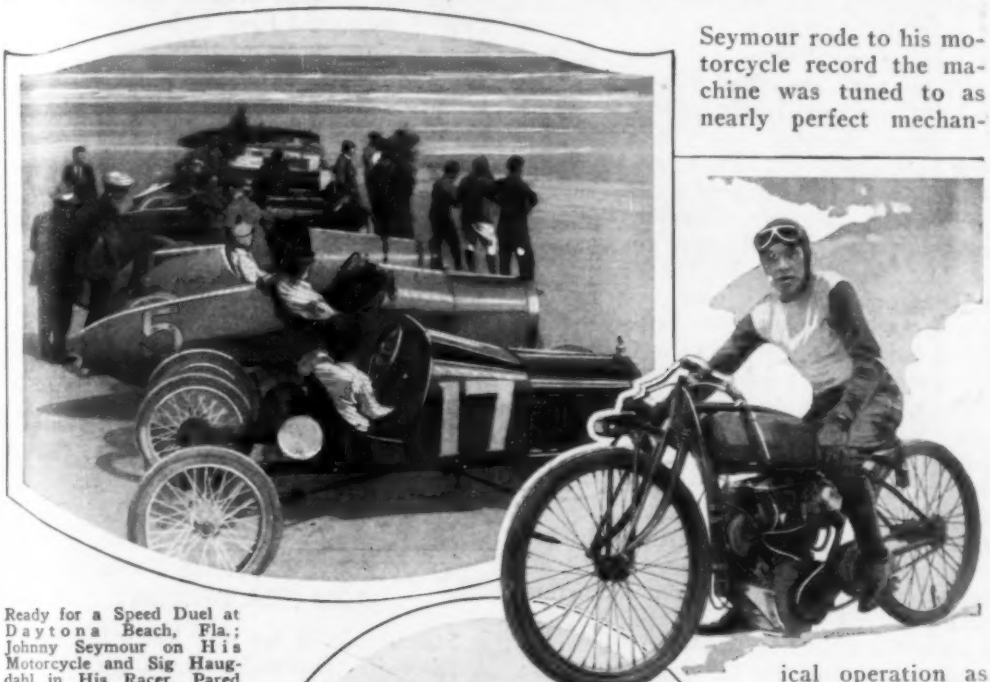
Using Loud Speaker to Direct Freight-Car Movements; "Hump" Foreman Seated before Microphone

SEWING KIT THAT FITS POCKET HAS THIMBLE FOR TOP

Needles, two kinds of thread and a thimble are carried in a compact sewing kit for emergency use. It is so small that it may be slipped into the vest pocket of a man's suit or into a woman's handbag. Space has been saved by using the thimble as a cover for the tiny tube-shaped holder that contains the equipment. The thimble is threaded on the inside so that it can be screwed on.

Sewing Kit Opened to Show Needle, Spool of Thread and Thimble Which Serves as Cover

HOW FAST CAN MAN TRAVEL ON WHEELS AND LIVE?



Ready for a Speed Duel at Daytona Beach, Fla.; Johnny Seymour on His Motorcycle and Sig Haugdahl in His Racer, Pared Thin to Cut the Wind

Johnny Seymour, riding a twin-cylinder motorcycle, recently attained a speed of 131 miles an hour, a world's record. Four years ago, Sig Haugdahl driving a race car of his own design made 180.27 miles an hour. Ralph DePalma, seven years ago, set a mark of one mile in 38.83 seconds from a standing start, while Tommy Milton holds the straightaway record of one mile in 23.07 seconds. All these records were made at Daytona Beach, Fla. Who will be the first human being to drive an automobile at a speed of 200 or perhaps 300 miles an hour? Are such speeds possible with gasoline vehicles? Can man-made machinery stand the strain? Is it possible to hold a car in its course when traveling faster than three miles a minute? What is the final goal of speed? When Johnny Seymour rode to his motorcycle record the machine was tuned to as nearly perfect mechanical operation as possible. The slightest imperfection probably would have resulted in the rider's death. Sig Haugdahl's ride to fame followed months of painstaking preparation. Never before had an automobile been operated at a gait so swift. The velocity was much more than double the fastest speed ever made by an express train. The strains were the greatest to which a motor car had ever been subjected. The apparently insurmountable obstacle that had to be overcome was to secure perfect balance in the wheels. Engineering science has demonstrated that a very slight difference in "tire weight," when the wheels are revolving at 1,500 revolutions or more a minute, may result in a fatal smashup. An automobile whose wheel balance is perfect for a speed of seventy miles an hour is entirely out

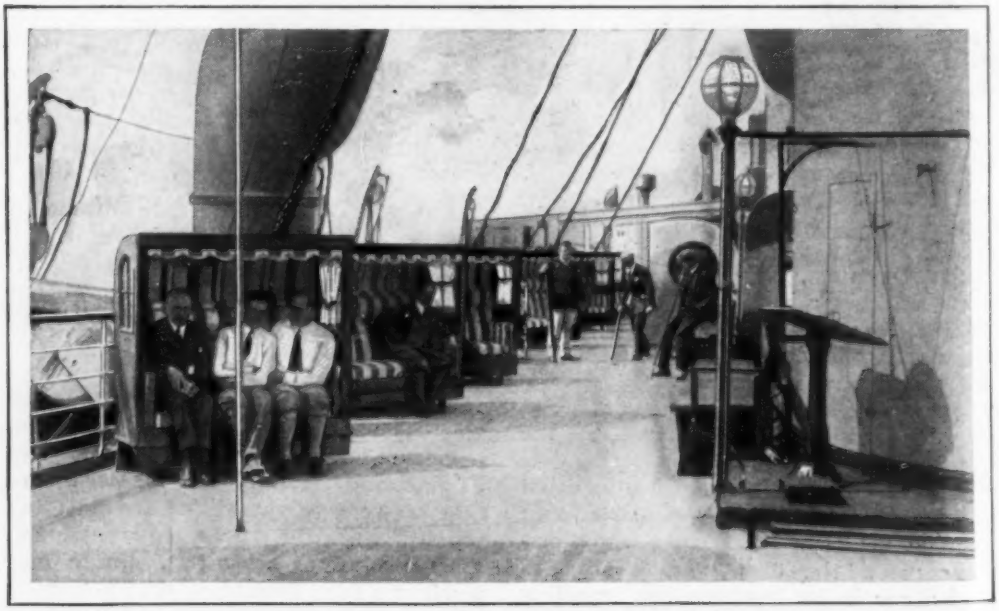
of balance, according to racing requirements, when its velocity is doubled. Haugdahl rigged up his racing car under laboratory conditions to simulate the track try-out. He found that an automobile tire turning at 1,800 revolutions a minute was so affected by centrifugal force that its diameter was increased one inch. Allowance had to be made for this in balancing the wheels. Further research proved that a tire revolving at a high speed would develop a so-called "heavy spot" at various points. This would throw the wheel out of balance. Altogether, it took about a month of patient experimentation to secure complete wheel balance. When a motor car travels at a speed of three miles a minute or faster, the resistance of the wind is very important. The Haugdahl racer was equipped with a sharp nose like the keel of a ship which gradually tapered to maximum width in the driver's compartment. All projecting parts were cut away. The car was trimmed down so that it offered the slightest possible resistance to the wind. It is only on a straightaway course such as Daytona beach that a speed of 180 miles an hour could be attempted. Haugdahl tells that it was impossible for him to hold his car in a straight course. The path of the car wobbled over a stretch of roadway 100 feet wide. To attempt even a slight curve at that speed would have ended in a wreck. The nervous strain of that wild ride was terrible. He believes faster cars can be built and that the real problem is to find men with the endurance to drive them.

SAND BOX FOR WASHING DISHES REDUCES BREAKAGE

To reduce loss from breakage and to save time in cleaning hotel crockery, an English proprietor uses wooden troughs filled with a mixture of damp sand and salt. Stains from grease, tea and other substances are quickly removed by rubbing the dishes in this preparation, it is said. The utensils are then given a final cleaning with water. About twenty-five per cent of the mixture is salt.

BOARDWALK CHAIRS ON SHIP ADD SEA LUXURY

Steamer decks are now being furnished with comfortable roller chairs, such as are commonly seen on boardwalk promenades on shore. They hold three or more persons and can easily be shifted about to shield the occupants from the wind.



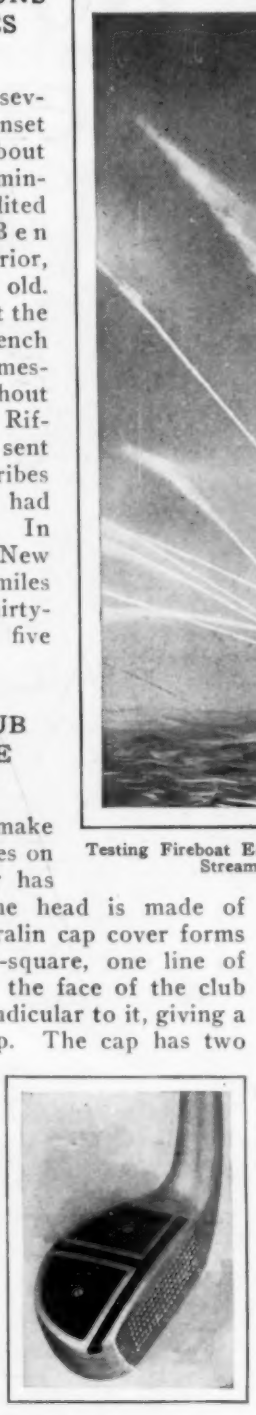
Like a Beach Promenade, the Modern Steamer Deck Is Furnished with Comfortable Sheltered Seats for Watching Games; They Are Easily Moved to Protect Occupants from Wind or Sun

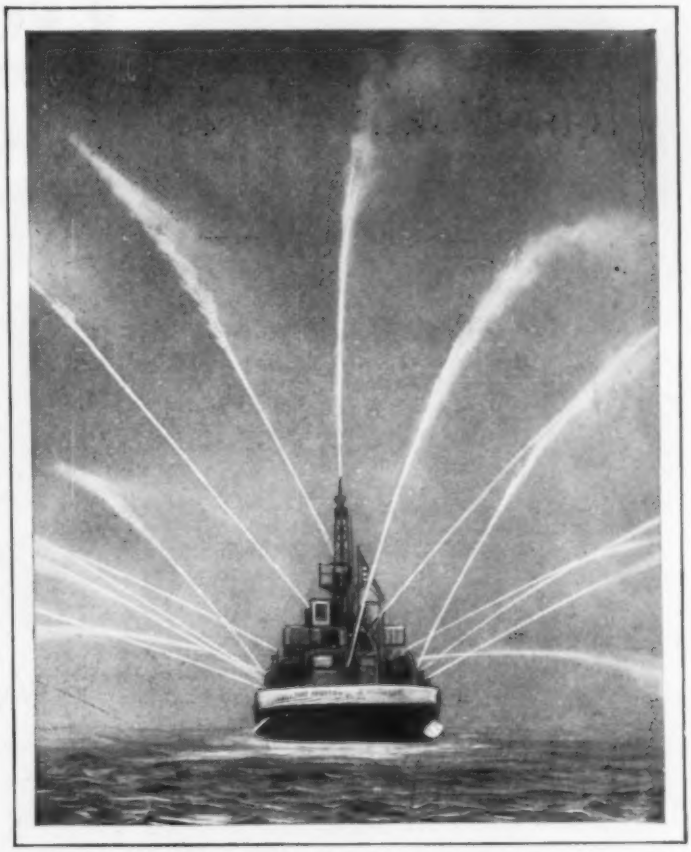
RIFF COURIER RUNS SEVENTY MILES OVERNIGHT

Running nearly seventy miles from sunset to sunrise, or in about ten hours and thirty minutes, is the feat credited to Hammouch Ben Hadge, a Riffian warrior, sixty-seven years old. He arrived panting at the gates of Oujda, French Morocco, with the message, "No peace without autonomy," for the Riffian representatives sent from the Atlas hills tribes where the courier had started at sunset. In 1882, J. Saunders of New York ran seventy miles in eleven hours, thirty-four minutes and five seconds.

GUIDE ON CLUB TO IMPROVE GOLF GAME

To help golfers make more accurate strokes on the green, a putter has been designed. The head is made of aluminum and a pyralin cap cover forms the design of a T-square, one line of which is parallel to the face of the club and the other perpendicular to it, giving a true line to the cup. The cap has two compartments in which small pieces of lead are inserted to give weight to the club. The player can regulate the weight at will. This is considered a great advantage to one who habitually cuts or slices his putts, because he can correct the tendency by redistributing the weights in the front and rear compartments.





Testing Fireboat Equipped with Diesel Engine; It Can Throw Thirty-Nine Streams at One Time and Has Considerable Speed

FIREBOAT WITH DIESEL ENGINE THROWS MANY STREAMS

Thirty-nine columns of water can be thrown simultaneously from a Diesel-engined electric fire boat added to the equipment of an eastern city. Besides its enlarged fire-fighting facilities, it is said to have greater speed than similar boats and to be efficient in all-around operation.

STAGE PLAYS FOR RADIO ONLY IN BRITISH THEATER

Plans for a theater in which plays will be acted only for the benefit of a radio audience are under way in London. The project is the result of a recent successful broadcast of an opera performance from the Covent Garden opera house. Persons wishing to watch the actors were admitted on payment of a small charge.

Do You Remember When

The Original Village Blacksmith Shop Immortalized by Longfellow

Mr. Ford at the Fireside of the Wayside Inn, Sudbury, Mass.; Ancient Andirons, the Old Rifle and the Powder Horn on the Mantel Are Only a Few of the Relics Preserved

The Forge of the Village Shop Where the Smith Toiled with Brawny Arm; It Has Seen Service for 150 Years; at the Right, Mr. Ford Standing beside the Old Apple Grinder at the Wayside Inn

These Antiques collected by Henry Ford were in daily use?

The Old General Store at Diamond Hill, R. I., Has Been Purchased for a Model Colonial Village

Stagecoach That Once Rattled over the Roads in the White Mountains More than Half a Century Ago; It Broke Down on a Trip to California

One-Horse Shay and Mrs. William Diehl Holding Original Red-Horse Sign That Adorned the Wayside Inn, Made Famous by Longfellow's Poem; It Was Lost for Twenty-Five Years but Found Again in Wellesley Hills by Mr. Diehl

Natural-History Facts for Those Who Have Not Time to View the Exhibits; Sign at Cleveland Museum

WONDERS OF NATURAL HISTORY TOLD BY WAYSIDE SIGNS

Few of thousands of persons who pass the Museum of Natural History at Cleveland have the time to go inside, so a wayside signboard has been built on which interesting facts are given so that those who ride may read. "Grass has a skeleton of sand," one of the signs reads.

BIMETALLIC NUMBER PLATE TO FOIL CAR THIEVES

"More difficult to counterfeit than money," is the verdict of the underwriters laboratories on a special kind of automobile number plate now being manufactured. It is to be attached to the dashboard of the car and is made of copper and a white metal. The digits of the numbers are raised and stand out clearly in polished relief against a background of oxidized copper. The numeral plate is fastened in such a way that it can be removed only by prying. This results in mutilation that cannot be repaired. Besides the numbers, the plate carries a design characteristic of the make of the automobile.

Auto Number Plate in Position on Dashboard, and Close View Showing How It Is Embossed

SOUND WAVES THAT KILL FISH MAY CURE DISEASE

Sound waves which kill fish and cause a liquid to heap itself into a pronounced mound are being produced and studied by Dr. Robert W. Wood, of Johns Hopkins university, and Alfred L. Loomis, a New York banker. The waves have strange properties that may prove of importance in the treatment of disease. They are produced by an apparatus that has much in common with radio, employing a high-power alternating current which reverses itself 200,000 to 400,000 times a second. The reversals cause a quartz plate to expand and contract with great rapidity, as if it were breathing, and this constant vibration generates sound waves. With movements counted in hundreds of thousands to the second, the waves are several octaves above the highest notes audible to the ear. These sound waves travel through oil and into a beaker of water immersed in the oil. If a fish is swimming in the water, the waves have immediate effect on the creature. The first symptoms are such as to indicate that the swimmer has become numbed. Five minutes of exposure to the waves will result in the death of the fish. One of the curious phenomena brought about by the passage of the waves, is that the water fills with air bubbles, as the air in the liquid is forced out by the vibrations. These bubbles, each the size of a pinhead, instead of rising, remain in fixed positions, vibrating

Inside the Photographer's Motorbus Studio and View of Exterior; Children, It Has Been Found, Are Not Frightened in the Homelike Room, and Patrons Are Spared Bothersome Trips to an Office

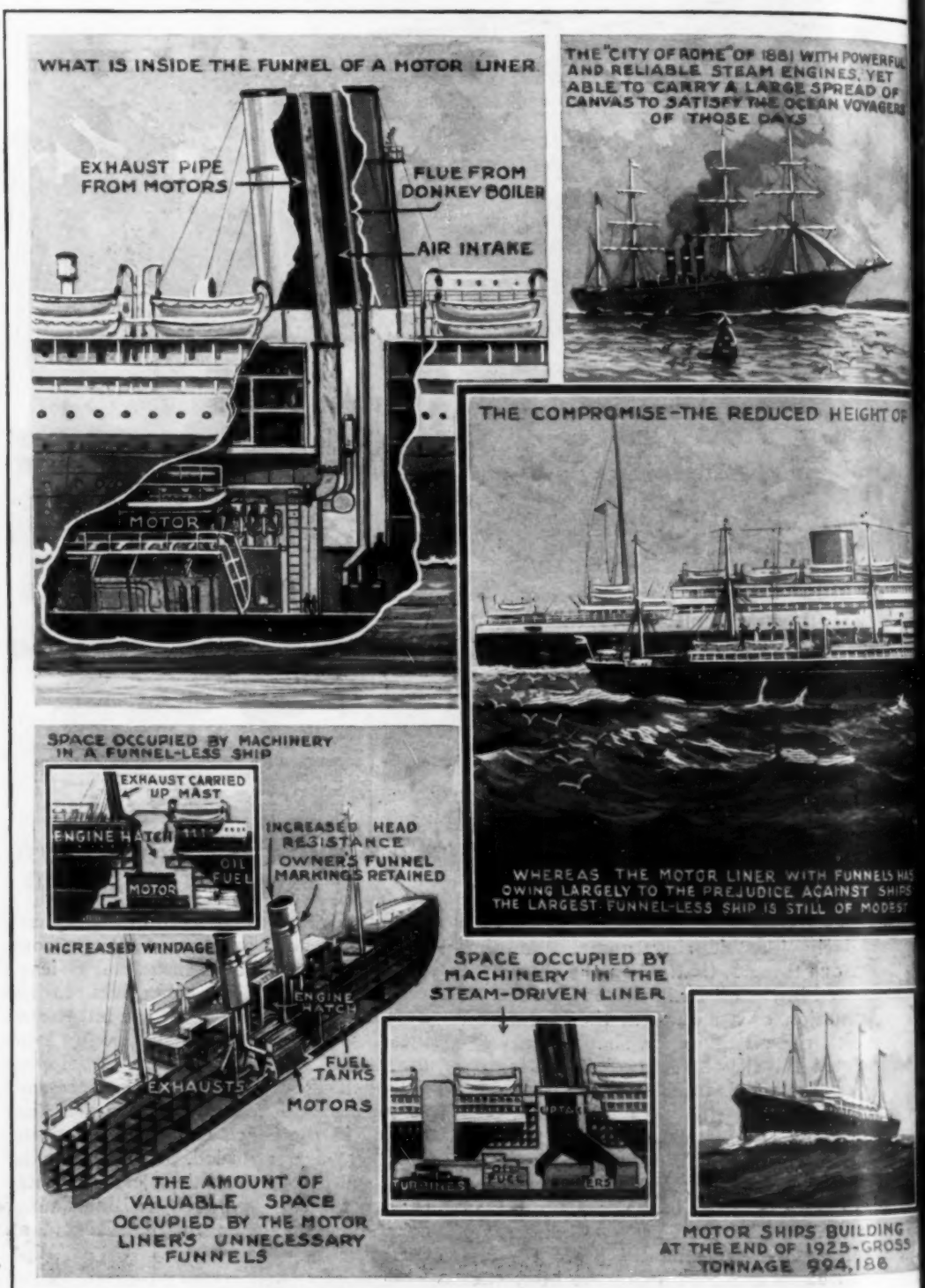
actively like dancing gnats. Another curious thing is that, when the waves are started in the oil bath, there is immediate formation of a mound at the surface, in which the oil takes the shape of a well-defined hillock, with its peak in the center. When a finger is inserted in the water one feels a distinct tingling of the flesh, produced by stimulation of the circulation. When withdrawn, the finger smarts and tingles in a way suggesting the sensation produced by catching a swiftly driven baseball. The medical possibilities are indicated by the stimulus given the circulation in any portion of the body that may be immersed in the water carrying the vibrations.

PHOTO STUDIO IN AUTO SAVES PATRONS' TIME

Motorization of the photographer's studio has been accomplished in a completely equipped auto coach a Chicago man has designed. He drives to the homes of his patrons who have but to step into his car for their poses, saving trips downtown at busy hours. Developing and printing materials, with the necessary screens, shades and other apparatus, are carried in the coach and various lighting facilities are afforded. The traveling studio already has made a cross-country tour to the east and back, visiting among other places Washington, D. C., and on the return trip, Detroit.

¶Under heavy pressure, a slab of marble will bend like stiff tar or wax.

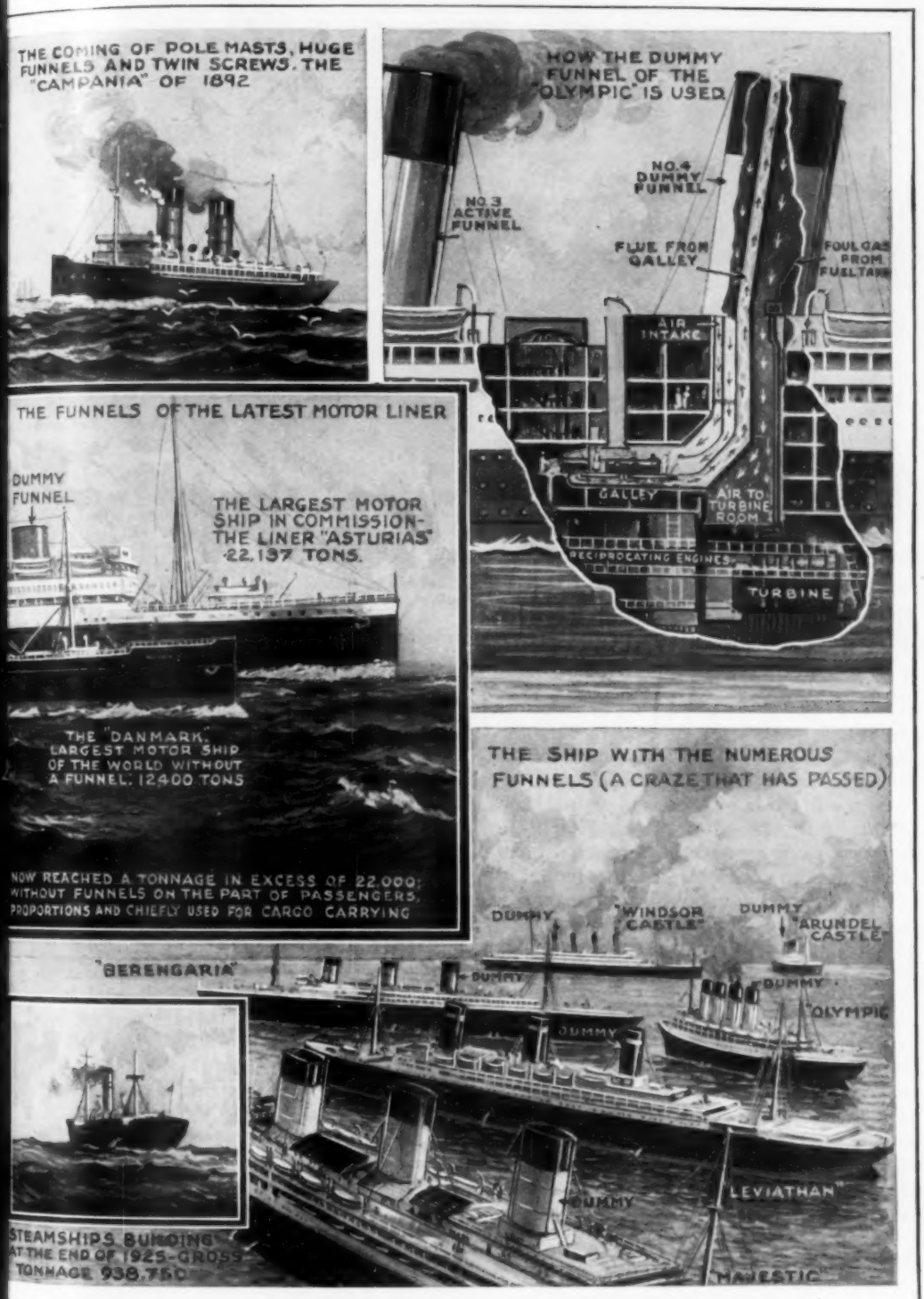
Dummy Funnels in Motorized Liners


WHAT IS INSIDE THE FUNNEL OF A MOTOR LINER
EXHAUST PIPE FROM MOTORS
FLUE FROM DONKEY BOILER
AIR INTAKE
MOTOR
THE "CITY OF ROME" OF 1881 WITH POWERFUL AND RELIABLE STEAM ENGINES, YET ABLE TO CARRY A LARGE SPREAD OF CANVAS TO SATISFY THE OCEAN VOYAGERS OF THOSE DAYS
THE COMPROMISE—THE REDUCED HEIGHT OF
WHEREAS THE MOTOR LINER WITH FUNNELS HAS OWING LARGELY TO THE PREJUDICE AGAINST SHIPS THE LARGEST FUNNEL-LESS SHIP IS STILL OF MODEST
SPACE OCCUPIED BY MACHINERY IN A FUNNEL-LESS SHIP
EXHAUST CARRIED UP MAST
ENGINE HATCH
OIL FUEL
MOTOR
INCREASED HEAD RESISTANCE
OWNER'S FUNNEL MARKINGS RETAINED
INCREASED WINDAGE
ENGINE HATCH
FUEL TANKS
EXHAUSTS
MOTORS
THE AMOUNT OF VALUABLE SPACE OCCUPIED BY THE MOTOR LINER'S UNNECESSARY FUNNELS
SPACE OCCUPIED BY MACHINERY IN THE STEAM-DRIVEN LINER
MOTOR SHIPS BUILDING AT THE END OF 1925-GROSS TONNAGE 994,186

© Illustrated

Constructors, Forced to Provide Smokestacks for Smokeless Ships, Convert Them into Air Ducts, Covering for Exhaust Pipes, and Use the Base Space as Storerooms for Supplies

to Satisfy the Ocean-Going Public


THE COMING OF POLE MASTS, HUGE FUNNELS AND TWIN SCREWS. THE "CAMPANIA" OF 1892
HOW THE DUMMY FUNNEL OF THE "OLYMPIC" IS USED
NO.4 DUMMY FUNNEL
NO.3 ACTIVE FUNNEL
FLUE FROM GALLEY
FOUL GAS FROM FUEL TANK
AIR INTAKE
GALLEY
AIR TO TURBINE ROOM
RECIPROCATING ENGINES
TURBINE
THE FUNNELS OF THE LATEST MOTOR LINER
DUMMY FUNNEL
THE LARGEST MOTOR SHIP IN COMMISSION- THE LINER "ASTURIAS" 22,197 TONS.
THE "DANMARK" LARGEST MOTOR SHIP OF THE WORLD WITHOUT A FUNNEL. 12,400 TONS
NOW REACHED A TONNAGE IN EXCESS OF 22,000; WITHOUT FUNNELS ON THE PART OF PASSENGERS, PROPORTIONS AND CHIEFLY USED FOR CARGO CARRYING
THE SHIP WITH THE NUMEROUS FUNNELS (A CRAZE THAT HAS PASSED)
DUMMY
"WINDSOR CASTLE"
DUMMY
"ARUNDEL CASTLE"
"BERENGARIA"
DUMMY
DUMMY
"OLYMPIC"
DUMMY
DUMMY
"LEVIATHAN"
"MAJESTIC"
STEAMSHIPS BUILDING AT THE END OF 1925-GROSS TONNAGE 938,750

London News

Public Association of Speed with Number of Funnels Resulted in Craze for More Smokestacks, So That Many of the World's Greatest Steamships Have More Than They Need

Testing Strain on Bridge While Engine Is Run over It; Observers on Platform Study Stresses with Aid of Special Instruments

STRAIN ON BRIDGES IS TESTED WHILE THEY ARE IN USE

While heavy locomotives were run across the bridge over the river Tyne in England during a safety test recently, delicate instruments erected on a temporary platform around one of the main supports of the structure, recorded the strain. Similar tests were made at different parts of the bridge and with the engines running at various speeds to reveal any weakness.

VEST-POCKET CRIBBAGE BOARD CARRIES PEGS INSIDE

Folding into a small packet, less than five inches long and half an inch thick, a cribbage board now on the market may be carried in the player's pocket, or occupies but little space in his luggage. The pegs are held securely on the inside of the board when not in use by means of a small pouch.

Pocket-Size Cribbage Board for Travelers; Pegs Are Fastened in a Small Pouch on the Inside

SEEK PREVENTION OF OIL-TANK FIRE BY LIGHTNING

An oil fire in California attributed to lightning, which caused the death of two men and a loss of $10,000,000, has resulted in a search for some way of eliminating this hazard. Oil-storage tanks are necessarily so large that reinforced concrete rather than metal tanks must be used. The tops are of wood, often covered with felt as a protection from the heat of the sun and evaporation. Frequently the space between the surface of the oil and the top of the tank becomes filled with an explosive mixture of air and oil vapors. In general, no lightning protection is used. In experiments at the General Electric laboratory with artificial lightning and miniature oil tanks, it was shown that where there are explosive mixtures, the protection problem is exceedingly difficult. Just as a considerable voltage may appear on transmission lines a mile or more from the lightning discharge, because of "wireless" or induction effect, so may sparks be caused by voltages induced in metal parts of the tank, even though the tank is not struck directly. A spark caused by a lightning stroke several miles away may ignite the mixture. If a tank were made completely of insulating material, there could be no spark, but there are always pipes, nails and conducting strips more or less isolated. Grounded wires strung over the tank, as in the case of a protected transmission line, would reduce the danger, but it would only mean that the storm would have to come closer to

Where Parades and Pageants Are Being Staged for Visitors to the Sesquicentennial Exposition in Philadelphia; 100,000 Persons Are Easily Seated in the Stadium

cause the spark. The only safe method where there is explosive gas is a complete metal tank, inside of which no sparks can occur. Even then there is danger when projections extend from the surface. There are a number of principles that can be applied to prevent the tank from being struck. It has been found, for instance, that lightning never strikes the ground nearer a conducting rod than four times its height. A number of rods properly placed about the tank would either take the hits or cause the lightning to strike the ground some distance away. Grounded wires strung over the tank, a grounded metal net or metal roof also afford a protection. The researches showed that a standing man is fifteen times more likely to be struck than a man lying flat on the ground.

NEW STAR BRIGHTER THAN SUN INVISIBLE TO UNAIDED EYE

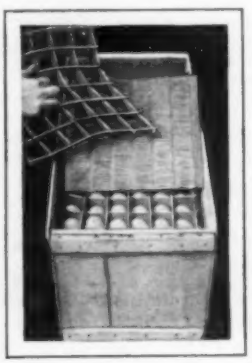
Discovery of a new star, which astronomers estimate is 4,000 times too faint to be seen by the unaided eye, has been announced. It is said to be 10,000,000 times brighter than our sun and is thought to have been formed during some celestial catastrophe that occurred millions of years ago.

BIG STADIUM FOR EXPOSITION SEATS HUNDRED THOUSAND

One of the chief structures erected for the sesquicentennial exposition in Philadelphia is the monster stadium where parades and other outdoor events are held. It has a seating capacity of 100,000 persons.

CUSHION PAD FOR EGG CRATES REDUCES BREAKAGE

Corrugated-cardboard pads with lengthwise grooves, placed between the layers in the egg crate, have been found effective in preventing the partition fillers from slipping and thus reducing breakage. They act as cushions and yet do not cut off ventilation. They are durable but so light that they add practically nothing to the weight of the shipment and their use will mean a worth-while saving.



Improved Method of Gathering Sap for Turpentine; Only Bark Is Cut Away to Preserve the Tree

TREE TAPPED FOR TURPENTINE SAVED BY METAL GUTTERS

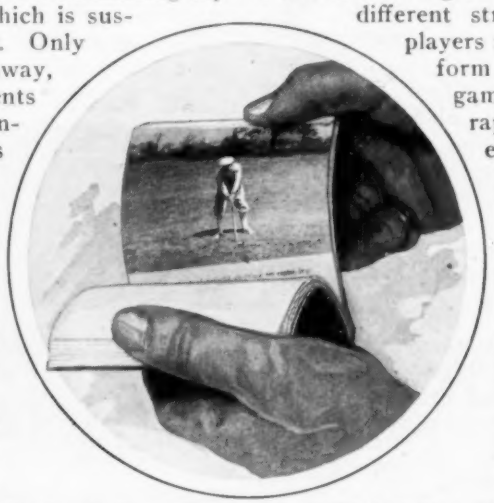
The turpentine industry in the south has been stimulated and further destruction of trees prevented through a cup of two thin metal gutters and an earthenware pot, the invention of a professor at the university of Georgia. The metal strips are fixed diagonally to the exposed base of the tree and direct the exuding sap into the receptacle which is suspended below the cut. Only the bark is stripped away, and this method prevents chopping and weakening the tree, a process that often caused extensive damage in the forests, as strong winds blew the trees down. Turpentine oil is now used extensively in paint and varnish manufacture, rubber making and in printing woolen and cotton goods to keep the colors from running together. The gutter invention, it is believed, will result in a revival of the turpentine-collecting industry in parts of the south where the supply had been diminished by the rapid destruction of trees.

FIND ANCIENT CHINESE DRUG GOOD FOR COLDS

Used by the Chinese for more than 5,000 years as a treatment for asthma, ephedrine has been found good for colds, as an anæsthetic and for raising the blood pressure or arresting bleeding in cases of hemorrhage. These uses are partial results of research conducted with the substance at the university of Wisconsin. Experiments are under way to determine if the drug is beneficial in treating hay fever. According to Dr. Ko-Kuei Chen, scientist at the university, ephedrine is considered superior to adrenalin in raising the blood pressure as its effects last over a longer period. The ancient Chinese doctors found that the substance caused muscles around the air passages in the lungs to relax, thus promoting easier breathing. The same experience has been met with in tests conducted with the drug at large clinics in Pennsylvania and Minnesota.

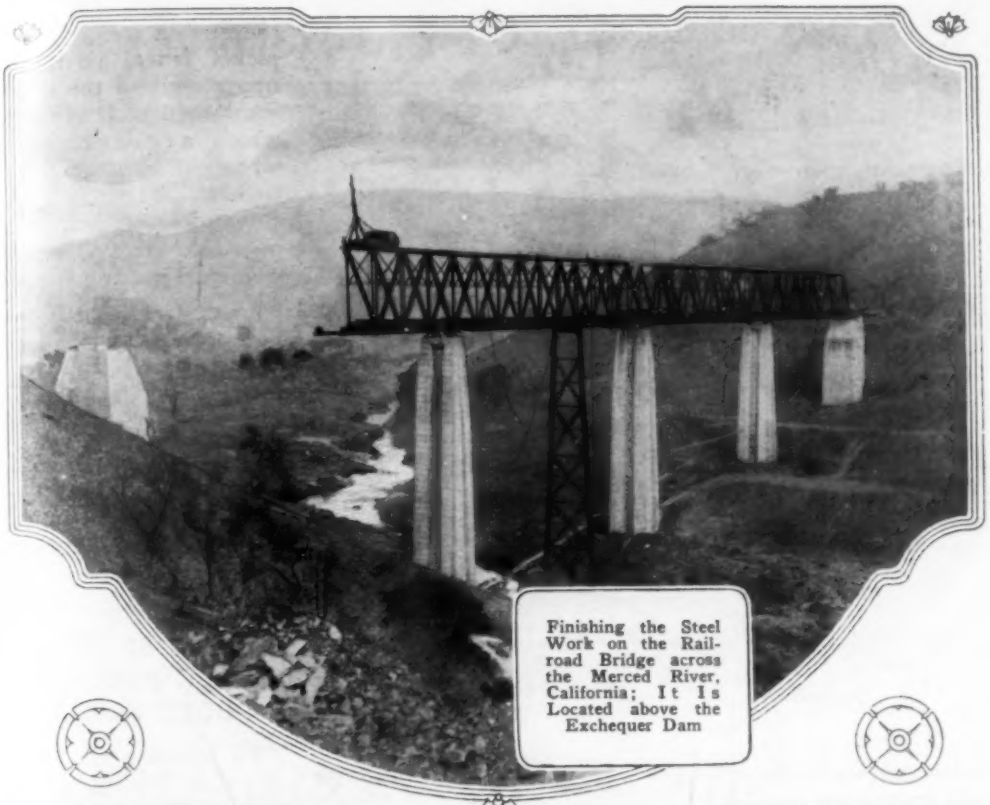
BOOK SHOWS MOVIES OF GOLF BY SPINNING PAGES

With the aid of a small book of illustrations showing successive stages in the different strokes of golf shots, players may study the correct form to improve their own game. Turning the pages rapidly produces the effect of a motion-picture film, or if more detailed study is desired, the pages may be turned slowly. A "still" is available at any time as a pattern for the player to follow, and the book is of sufficiently small size to allow it to be carried conveniently with the rest of the golf equipment.

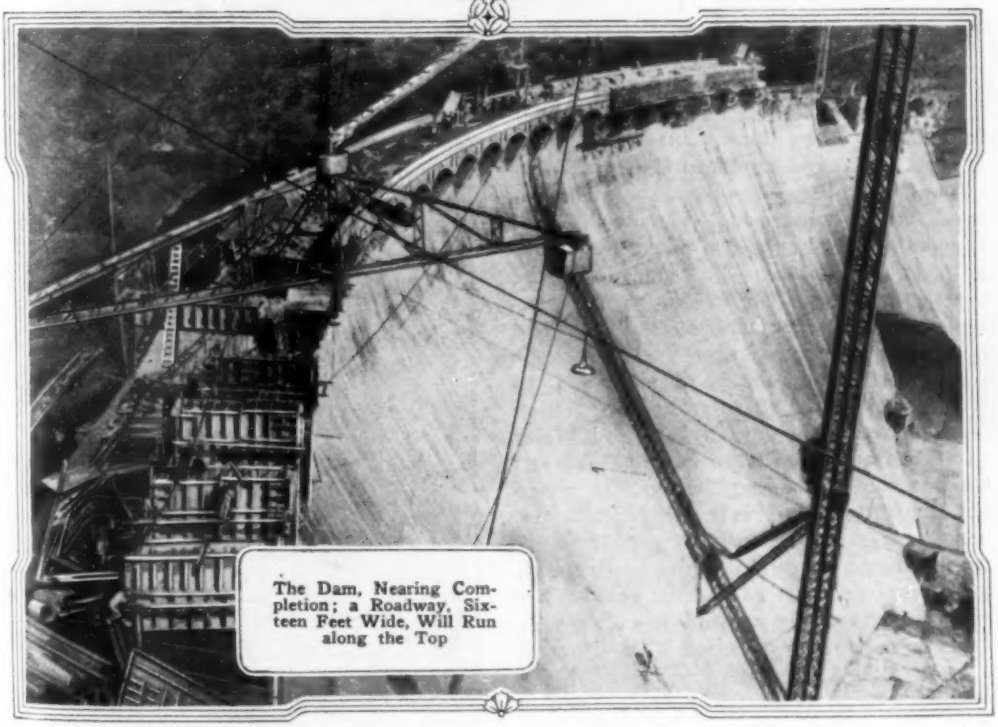


Turning the Pages Rapidly Produces "Motion" Pictures of Different Steps in Golf Strokes

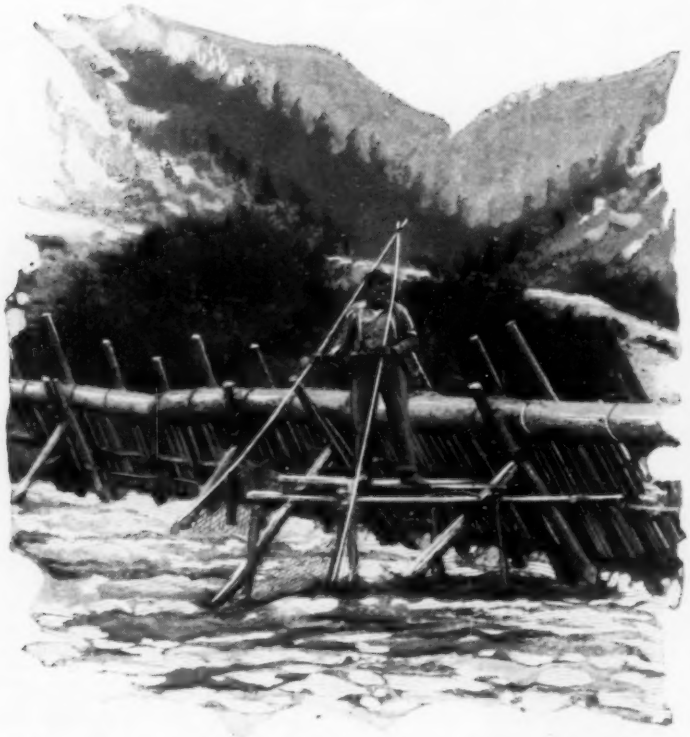
ONE OF NATION'S GREATEST FEATS OF ENGINEERING



Finishing the Steel Work on the Railroad Bridge across the Merced River, California; It Is Located above the Exchequer Dam



The Dam, Nearing Completion; a Roadway, Sixteen Feet Wide, Will Run along the Top



Indian Using the Dip Net to Lift Salmon from the Trap; behind Him Is the Crudely Fashioned Weir

INDIANS TRAPPING FOR SALMON SHOW SKILL AS BUILDERS

Certain rites are observed by fishermen in almost every land, but among the Hoopa Indians in northern California, the annual trapping for salmon, a principal food supply, is attended with special ceremonies and has caused a direct departure from tribal customs. The men do all the work of building the traps, for they believe that, if women assisted, no fish would come. Furthermore, no nails must be used, for these, too, are supposed to frighten the fish. The traps, white men declare, are inefficient, being crude affairs of stakes and boards with funnellike entrances and spreading "wings" to guide the fish into them. It is in constructing the weir across the stream that the Indians display their greatest cunning. Although it is swept away at each flood season, the workers cheerfully rebuild it every year and consider its destruction a good omen, a promise of a plentiful supply of fish the following year. It stretches straight across the stream and is like a picket fence, and the upper ends of the sticks are lashed to heavy logs which are securely braced by supporting timbers. The pickets slope downstream, adding to the strength of the weir and making it possible to rake driftwood over its top. Lashings are made of hazel boughs, for the Indians consider this kind the only suitable offering to the spirits that control the fishing. The salmon are lifted out with dip nets of coarse mesh, attached to two long sticks.

ROLLER SKATE ON POLE ADDS TO BOYS' SPORT

To increase the sport of roller skating, a pole with a third skate attached to one end, permits the boy to sit down while coasting and has a brake to check the momentum on curves or other places. It is carried like a hockey stick on a level course to help attain speed and is quickly placed into service as a seat. Fancy turns and movements can be executed with the pole, using it as a rudder.

Using the Roller Pole for Balance and Riding on It as a Coaster

POWDER MIXED WITH WATER CONQUERS OIL FIRES

Conquering the Blazing Pool of Oil with Stream of Foam, and Close View of the "Gun"

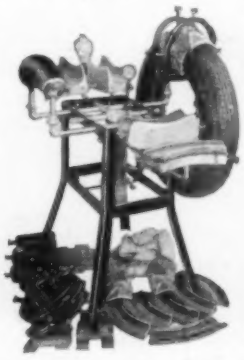
Heavy fuel oil and gasoline, 250 pounds of the mixture in a big pool, blazed up with a fierce flame. A queer-looking car was wheeled up, a hose connected and out shot a foamy mixture of powder and water. By a stop watch, the blaze was entirely extinguished in just twenty-six seconds from the time the thick stream first struck the pool. This happened at a test of the fire-fighting equipment in Chicago recently, before representatives of insurance companies and firemen. As water was forced through the hose, the powder was poured into it from the mixer, the result being a smothering coating of thick foam that shut off the oxygen from the flames. The apparatus is expected to be of special benefit in combating oil fires as it does not spread the ignited liquid.

BULLET-PROOF ROTARY SHIELD TO PROTECT SOLDIERS

Tests with a whirling shield that is said to deflect machine-gun fire less than a foot from the soldier's face have been conducted by the army. It was devised especially to protect men on tanks from flying shell fragments as well as bullets and consists chiefly of a mushroom-shaped cap of half-inch steel, about three feet in diameter and two feet high. A series of narrow slits in the cap, although too small for clear vision when the shield is stationary, permit a good view when the steel is rotating so that men behind it can see out and are safe from gun fire at the same time.

BALLOON-TIRE VULCANIZER HAS POWERFUL CLAMP

Both the inside and the outside of balloon tires are vulcanized in one operation with a special outfit now on the market.

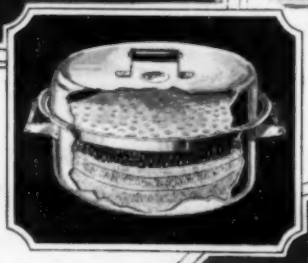


It has a steam-heated curing arm of special design which is inserted inside the tire during the repair process. It also is provided with a powerful clamping arrangement that is said to exert tons of pressure on the vulcanized area, and sufficient to force little rivets of rubber through the fabric. Heat is supplied from a boiler fitted with a burner for use with either gas or gasoline.

To Save Work

Various Lighting Effects Are Possible with This Perpendicular Lamp Bracket, and Socket at Bottom Affords Extra Connection for Cord or for Another Bulb

Ironing-Board Cover That Snaps On, Has Strong Elastic Band around Edge



Cooker with Self-Basting Tray, Saves Gas, as Only One Burner Is Needed for Preparing Meats, Vegetables and Desserts, and Foods' Nutritious Juices Are Retained; Section View at Right

Timing Switch Automatically Turns Electric Current to the Cooking Dish, Flatiron or Other Implement On and Off as Desired

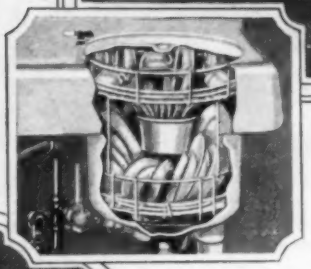
Two-Handled Can Opener Prevents Cuts from Round or Square Lids

Anyone wishing further information on devices described in the editorial pages can

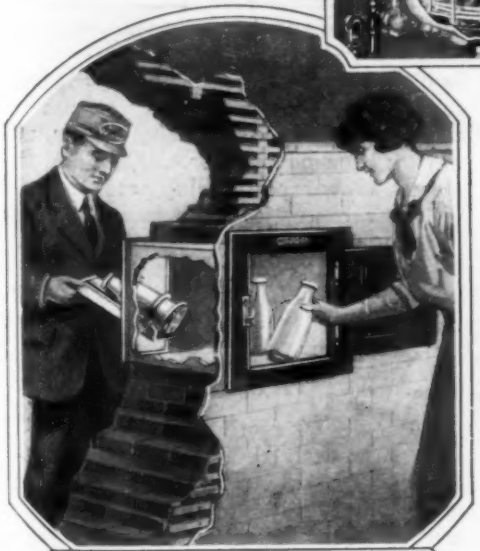
in Your Home

Bluing in Tape Form Cannot Be Spilled and Amount to Use per Gallon of Water Is Marked on Edge

Folding Hanger for Women's Garments and Soft-Haired Brush Both Slip into Leather Case to Fit Traveling Bag



Electric Dishwasher, Built as Part of Sink, Cleans, Rinses and Dries; a Revolving Dasher Hurls Water to Every Part of the Stack and a Turn of the Handle Drains the Washer

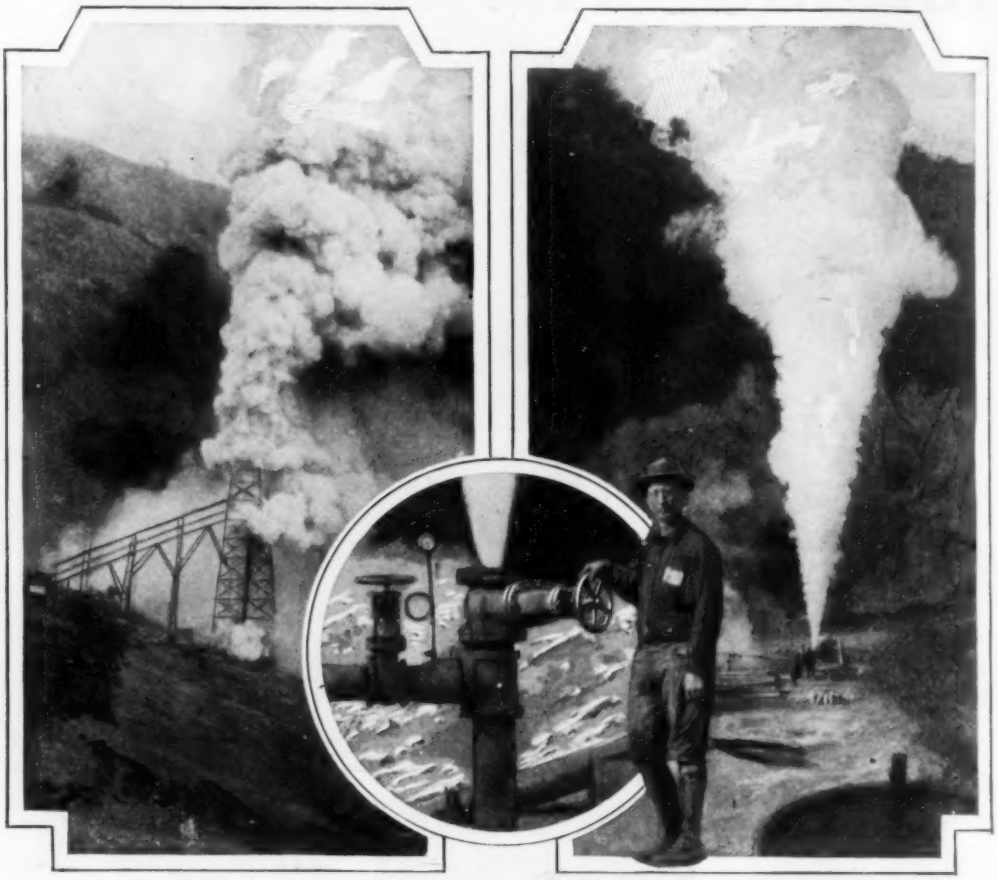


Milk-Bottle Trap Locks When Last Bottle Is In; Unlocks Only from Inside

For Better Pie Crusts, Biscuits and Other Pastry, This Meshed Mixer, Replacing Knife, Quickly Blends Shortening with Flour

obtain it by addressing the Bureau of Information, Popular Mechanics Magazine, Chicago

STEAM FROM WELLS IS SUCCESSFULLY HARNESSED



Scenes at California's Natural Power Plant Where Man Has Tapped and Harnessed a Subterranean Steam Supply; Pressure of 276 Pounds Was Developed at One of the Wells

Development of steam at high pressures from the ground by means of wells has proved a success in California. There seems to be no doubt but that the problem presented by non-condensable gases can be solved. A small turbine containing blades of different metals has been operated on natural steam from one of the wells and the drilling engines have used it for several months with no trace of corrosion. So far the tests indicate that a metal for turbine blades can be made which the gases will not attack. In drilling the wells, an open hole is first driven into rock as far as possible. Into this a ten-inch steel casing is set, and the space between the casing and the walls of the hole filled with cement. Then the hole is drilled deeper into the rock until the flow of steam is good. Considerable difference in quantity and pressure of steam is found in different wells. The highest pressure reached is 276 pounds. Some wells, after having been opened for a while and then closed, show rapidly rising pressure, while in other cases, it takes several days to build up the highest pressure recorded. In cold weather the steam clouds rise to a height of 500 feet and more.

BIG INCREASE IN MOTORSHIPS AND POWER OF ENGINES

Tonnage of motorships completed in 1925 was nearly three times that of 1923, according to reports from England, and motor vessels totaling about 1,500,000 tons are in course of construction. The figures do not include ships under 2,000 tons and are considered the more remarkable

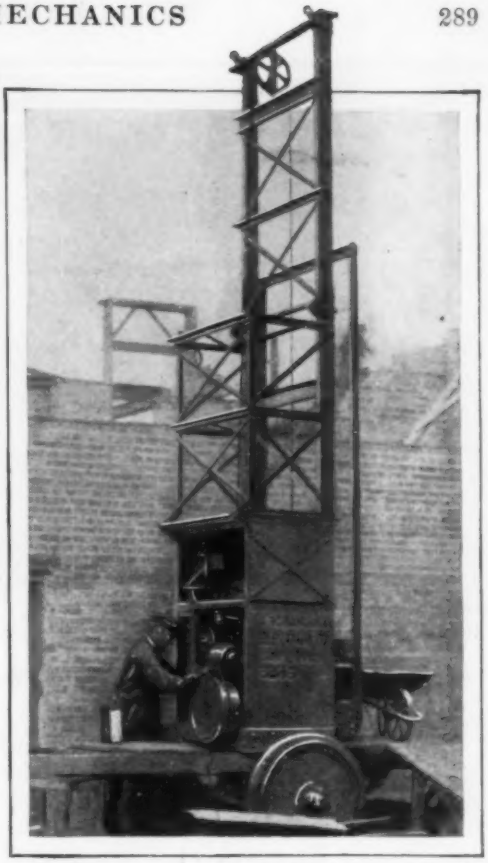
because the period covered was not especially active in shipbuilding. Firms that once embark on motor-vessel programs do not go back to steamers, it has been found. Instead, more orders are placed for motorships. The principal advantages claimed for this form of propulsion are that additional cargo space is provided, there is a wider range of action, higher average speed, the task of refueling is simplified, and both fuel and lubricating-oil consumption are reduced. A comparison was made between two ships of about 9,200 tons each, one a steamer, the other burning oil. It was found that the oil burner cost about $25,000 less per year to run, while its cargo capacity was thirteen per cent greater. The tonnage of motorships built in 1925 was 1,004,915 and the horsepower 420,820. Engines of far greater power are being built as part of the rapid conversion to motor vessels.

PORTABLE SPRAYER HAS MOTOR AND SERVES AS CLEANER

Operated by current from a light socket, a motor-driven sprayer now on the market is said to throw a fine mist of liquid insecticide twenty feet and with sufficient force to penetrate cracks and crevices. It is easily carried about, motor and all, and special attachments are provided whereby

Motor Blower on Sprayer Affords a Stronger Blast than a Hand-Power Plunger, and Saves Work

it may be used as a vacuum cleaner or as a blower to remove dust.



Contractor's Portable Hoist in Operation; It Can Be Moved Quickly to Any Part of the Job

ELEVATOR ON TRAILER TRUCK EXTENDS LIKE TELESCOPE

For hoisting building materials, a portable telescoping elevator mounted on a rubber-tired trailer truck, saves the contractor considerable time and labor. It can be extended to reach to the top of a three-story structure and can be moved at a moment's notice to any part of the job.

RULING PEN WITHOUT SCREWS

Fitted with a sliding sleeve instead of the usual screw, a ruling pen now on the market is said to be more easily adjusted to drawing lines of different widths and can be cleaned thoroughly with little trouble. The spread of the blades is held by an arrangement of notches and a catch on the sleeve. To release them, the blades are simply pressed together, and to aid in resetting, the notches are numbered. The pen is said to be especially useful on large tracing work.

Replicas of Museum Rings, Illustrating Symbol's Use in Wedding Rites of Different Countries

WEDDING RITES OF CENTURIES REVEALED IN RINGS

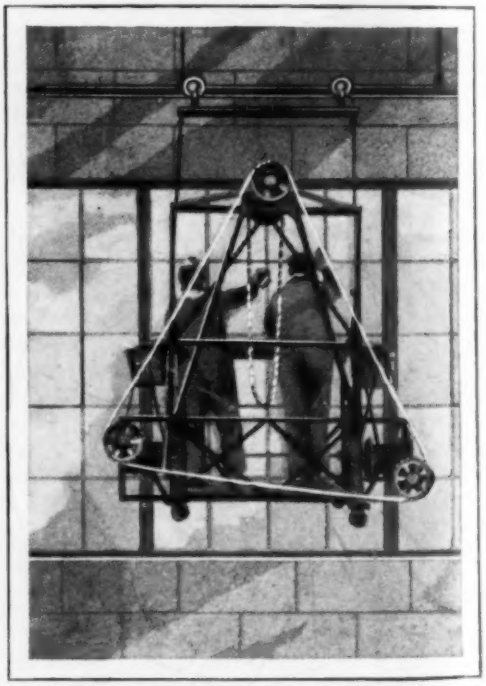
Replicas of various styles of wedding rings which have been collected in the museums of the world, were displayed by a Los Angeles jeweler not long ago, illustrating the widespread use of this symbol throughout the centuries. The wedding ring was probably developed from the engagement band which came into use in early Roman times. It was first made of iron and later of gold and signified a vow that the contract would be fulfilled. The ring custom was of secular origin and, a few centuries later, became connected with ecclesiastical rituals.

MOTOR COACH AS DINING CAR TO SERVE AUTO TOURISTS

Persons stopping at automobile-tourist camps and visitors at country fairs, and the like, will have dining-car facilities similar to those provided on the railroads in a completely appointed motor coach designed for serving meals. It is equipped with four tables and eighteen chairs, has a kitchen with hot and cold water, a refrigeration system, soda fountain and other conveniences of a modern restaurant. An improved ventilating system, radio and attractive schemes of interior and exterior decoration are additional features. The coach is said to have been conceived from a two-wheel pushcart used by a young man in supplying edibles to campers at a Maine resort a few years ago. His business was so successful that an inventor, who had become interested in it, planned the motor dining car which has been prepared for use this summer.

WINDOW WASHERS' RAIL CAGE REDUCES ACCIDENTS

To safeguard the lives of window washers on tall buildings and to save time, a cage large enough to hold two men is suspended from a permanent rail hung from the eaves or bracketed to the wall. The car runs on a ball-bearing carrier and can easily be pushed along. It is raised or lowered by means of a chain hoist. Besides room for the workers, there is space for pails, brushes and wipers. Guards on each side of the cage prevent falling. The apparatus is useful when the sides of the building are to be cleaned and the rail can be installed in such a way that it does not mar the appearance of the structure.



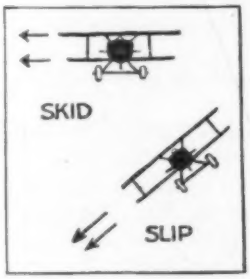
Window Washers' Cage on Track Is Pushed along Entire Side of Building

WINGED WORDS YOU SHOULD KNOW

By CAPT. TOWNSEND SCOTT

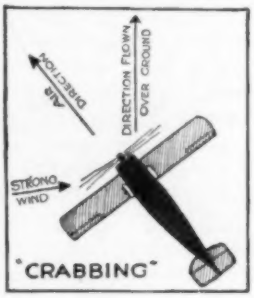
WITH the constantly increasing number of planes carrying passengers, mail and freight and daily playing a more important part in our lives, a language of the air has been born.

Short, descriptive words, as colorful as those of the frontier or of the Forty-niners, have been coined to meet a new human need resulting from the conquest of another element—the air.

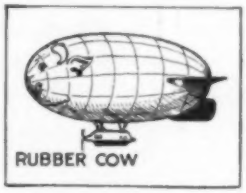


The "gun" of the pioneer days has come to mean the throttle of an airplane, to "zoom" is to make the plane alternately climb and dive, and drifting with the wind is described by the one word "crab." Some of the other expressions in daily use and their meanings follow:

Pilot: The aviator or flyer of an airplane, frequently pronounced "Peelo," the alleged French pronunciation.



Kee-Wee: In Australia there is a bird which has no wings. It runs along the ground crying, "kee-wee, kee-wee." In America there is also a member of the flying fraternity who cannot fly and he is named after his Australian cousin "Kee-Wee." He is the ground officer in the air service.



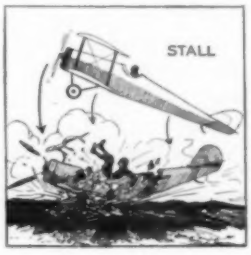
Kay-Det: The would-be "peelo," while in training is known as a cadet, pronounced kay-det.

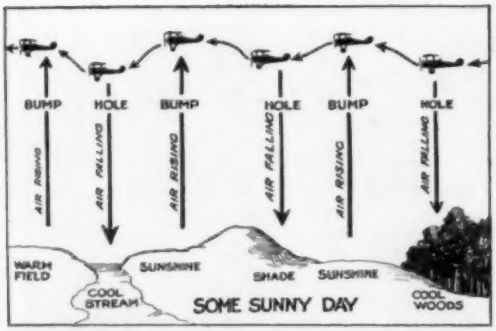
Crew: The enlisted men who tend a ship are its crew, and the leader of this band is the crew chief.

Job: All planes are jobs. Having a rotten job has nothing to do with the pilot's occupation. It describes the chariot in which he must ascend to heaven.

Jenny: A Curtiss J. N. training plane, slow and fairly sure, used to train kay-dets.

D. H.: During the war, the U. S. decided that it must have a better engine than anybody else, so the Liberty was designed. Then it was suddenly discovered that





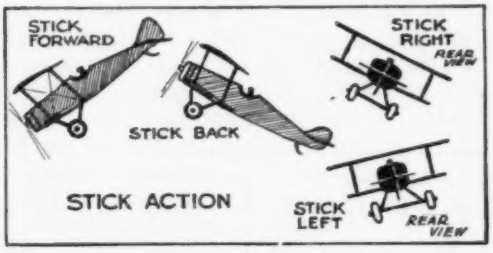
we had no plane to fit the motor. Finally it seemed that it would fit in a British plane called the DeHaviland or D.H.

Martin: A large, two-motored plane, built to carry bombs, generally known as "pills."

Crate: Planes of ancient vintage.

Attack: Larger planes capable of doing damage to ground area in wartime.

Hotter than Air: The branch of the air service which has to do with aircraft



made lighter than atmosphere is called lighter-than-air, affectionately known as "Hotter than Air," and its members are the boys who ride the rubber cows.

Rubber Cow: All aircraft kept aloft by gas, such as a balloon or dirigible.

Prop: The propeller, which pushes or pulls the aircraft through the air.

Gun: The throttle or accelerator. "Give her the gun," means "step on it."

Tac: The tachometer, or "tac," is an instrument which tells how many revolutions or "revs" per minute the prop is making.

Altimeter: The instrument which shows through diminished air pressure, how high the plane is above "Grandma Earth."

Stick: An arrangement resembling a broom handle situated in front of the pilot's seat and attached to a universal joint on the floor. This is connected by wires to the elevators and ailerons and controls them. The peelo grasps the stick gently but firmly in one hand and pushes it in the direction toward which he wishes the plane to tilt, the horizontal guiding of the plane depending on the rudder, controlled by a bar on which he places his feet.

Elevator: The elevators make the plane point up or down and consist of horizontal rudders, placed on each side of the regular rudder on the tail of the plane.

Ailerons: The flaps on the rear ends of the wings which cause the plane to tilt from one side to the other.

Contact: The signal yelled out as a warning to show that the switch is on and that any movement of the prop may start the motor.

Revving Up: After the motor has been started, the peelo warms it up to be sure it is in working order. He watches the tac to see how many revs the prop is making. This is revving up.

Conk: When the motor stops suddenly from any cause, it is said to have conked.

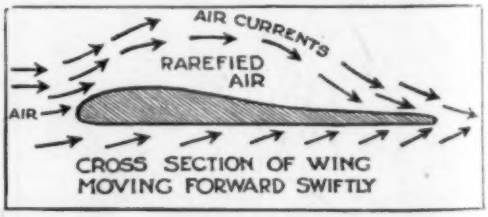
Taxi: Running the plane over the ground on the take-off.

Stall: When the ship is headed up at a greater angle than that at which its speed will allow it to climb, it will stall like a flivver on a hill, and topple over toward the earth.

Roll: To turn the plane over and over sideways.

Crab: When the wind is blowing hard enough, the plane must be headed at an angle into the wind to fly toward its destination. The result is that the plane moves over the ground in a sidewise position. This is called crabbing.

Flying Speed: Like the bicycle, the airplane must be kept moving in order to be controlled, otherwise it will topple over. The speed necessary to keep the plane going without losing altitude, and under



control, is called flying speed. If the motor conks, the plane must be headed down

to keep up flying speed so that it can be landed in the nearest field. Landings of this sort are called forced landings.

Low and Slow: Never has a kay-det been born who hasn't been warned by his family to fly low and slow. As pointed out before, the only way to keep control of a plane is to keep it always at good speed. Also, no matter what position the plane gets in, if it is high enough, it can be righted before it touches the earth. To fly low is dangerous.

Flop: Any unlevel or unusual flying.

Jazz Ride: Any pleasure ride generally implying a few flops.

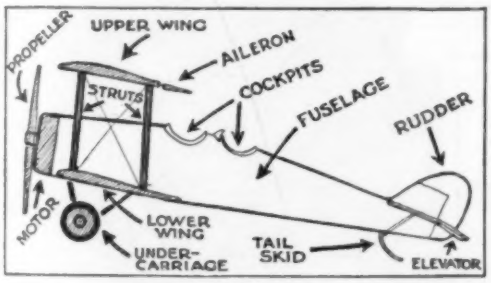
Wash-Out: Anything or anybody who is useless, or anything of a boring or sanctimonious nature is a wash-out.

Crack-Up: When anyone washes out a plane without doing any real damage to himself, he is said to have cracked-up.

Crash: A serious accident.

Bumps and Holes: Over cool spots on the ground, air falls; over warm spots, it rises. These currents cause uneven flying and are called bumps and holes.

Why She Flies: Air is theoretically a solid matter. The propeller is built on the principle of an auger or screw which, if



turned, must necessarily penetrate further into the material in which it is placed. It acts in the same manner as a propeller on a boat. As the propeller is turned rapidly by the motor, it pulls the plane over the ground attaining more and more speed. As the wings of the plane move through the air, the air hitting upon their entering edge is thrown upward as shown in the diagram. The faster the plane moves the higher above the wing the air is thrown, causing a rarefaction of air on the tops of the wings. This causes suction on the tops of the wings, same having a tendency to pull the wings up and so cause the plane to rise from the ground.

Using Flatiron with Electric Shoe Attached and as Heater

ELECTRIC SHOE FOR FLATIRONS ALSO HEATS DISHES

Ordinary domestic flatirons are quickly converted into electric ones by attaching a metal shoe or base a French inventor has introduced. It is supplied with current from a lighting socket and, when turned over, may be used as a plate to keep dishes warm.

WEIGH YEARLY FALL OF SOOT TO MEASURE SMOKE EVIL

Tangible evidence as to the magnitude of the smoke problem has been gathered by weighing the annual fall of soot in several large cities. In the dirtiest of ten centers observed in 1924, it was found that 794 tons of soot and dust fell per square mile for the year, while in the cleanest community the deposit was 101 tons per square mile. Soot from industrial chimneys contains a great quantity of ash grit and but little nitrogen, so that it is not valued highly as fertilizer, while deposits from domestic chimneys, although richer in nitrogen, contain a larger proportion of tarry matter, which clogs the pores of plants and ultimately stunts or kills them.

LATEST ACHIEVEMENTS IN WORLD OF INVENTION

Furnace Appliance Which Converts Refuse Materials, Such as the Residue from Crude Oil, into a Burnable Gas for Generating Power, and, at Right, Light Airplane Engine in Test at McCook Field

Sounder Measures Depth from Ship's Keel to the Bottom of the Ocean

Testing Improved Waterproof Paper Cups at Bureau of Standards

HOW TO BE SAFE IN TORNADO IS TOLD BY EXPERT

Although almost any place in the path of a tornado is dangerous, a person is safer inside a house or other building than exposed to the whirling timbers and other debris outdoors, according to Prof. Frank H. Colyer of the southern Illinois state normal university. His observations are based on a study of the results of the disastrous storm that swept through Missouri, Illinois and Indiana last year. The basement is generally one of the safest places of the house, he declares, although a person should be careful to keep away from stoves and furnaces. Lying near a strong box, steel bed or exceptionally stout table sometimes protects from serious injury as the objects keep timbers and ceilings from falling. Hallways where the walls are close together are usually safer than large rooms, for if the ceiling should drop, there is nothing to break the crash in a large room.

WOODEN HORSE THAT "WALKS" EXERCISES CHILDREN

To replace the old-fashioned children's rocking-horse, a similar amusement device now on the market is operated in somewhat the same way but moves forward while the rider performs the same rocking motion. The child places its feet on a front cross member which is covered with rubber to prevent marring the floor. Leaning forward causes the rear of the horse to rise slightly and bring up the hind legs. When the child rocks back, the front legs move out in front as the weight is shifted to the rear. Thus the horse "walks" ahead, the exercise bringing the child's muscles into beneficial play besides affording amusement. It has been suggested that larger horses would afford grown-ups healthful sport.

Riding the Walking Horse for Healthful Exercise and Fun; It Makes Steady Progress as Child Rocks

Mrs. McCaig in the Center and Samples of Her Posterette Designs of California Scenes

WOMAN PAINTER PAST SIXTY DEVELOPS UNIQUE ART

"Posterettes," tiny paintings of California scenes painted by Mrs. Flora McCaig of Pasadena, and reproduced on glued stamps slightly larger than the familiar Red Cross sticker, are being used by persons sending letters and even by commercial firms. They are printed in bright colors to represent the landscapes as the artist sees them and are carefully finished. Mrs. McCaig, now over sixty years old, has exhibited other paintings and developed the idea of the posters to express the delight she took in the scenic features of her California home.

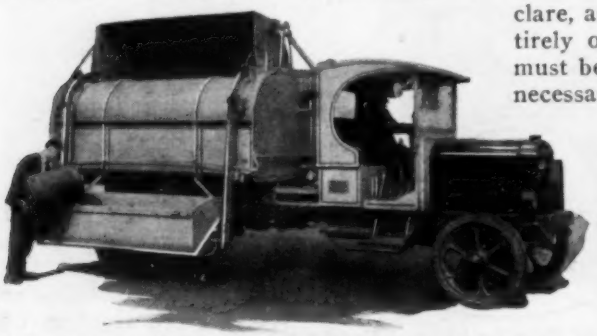
Clay Castle Model in Pond Setting; Its Size Is Apparent from Rowboat and Children beside It; the Materials Used Soon Showed Signs of Aging, Helping the Illusion

MODEL CASTLE BUILT OF CLAY FOR POND DECORATION

Set in the midst of a small lake, a model of an old English castle has been fashioned of clay by a British artisan. It is said to be an exact replica of the one occupied by the earl of Sussex in the time of Charles II and twelve years were required to complete it.

BUCKET LIFT ON REFUSE TRUCK SIMPLIFIES LOADING

Unpleasant odors and dust are reduced in handling garbage or ashes in a motor truck that has a bucket that lowers to a point requiring only a thirty-inch lift for dumping the receptacle. When ready for emptying into the main container on the truck, which has a capacity of five to six tons, the hopper is raised and lowered again for refilling by a chain mechanism operated from the driver's seat. To dump the truck, a huge door is automatically unlatched at the rear, and the body elevated to an angle of forty-five degrees. Faster loading with less labor and dirt on streets is obtained with this truck, it is claimed, and it also reduces exposure to disease. A metal curtain confines dust and odors after the bucket is dumped.



Filling the Lift Bucket on Refuse Truck Is Easy as It Is Lowered within Thirty Inches of the Ground

DEATH OF MANY TREES CAUSED BY LACK OF FOOD

Proper nourishment is as essential to trees as it is to human beings, experts declare, and since the tree is dependent entirely on its environment for food, care must be taken to see that the soil has the necessary elements for growth. Trees send out distress signals in the form of brown leaves, thin foliage and dead branches when they are not obtaining sufficient nourishment. Growing plants are likely to exhaust the nitrogen, phosphorus and potassium in the soil so that these elements often must be supplied artificially to insure the tree's proper growth.

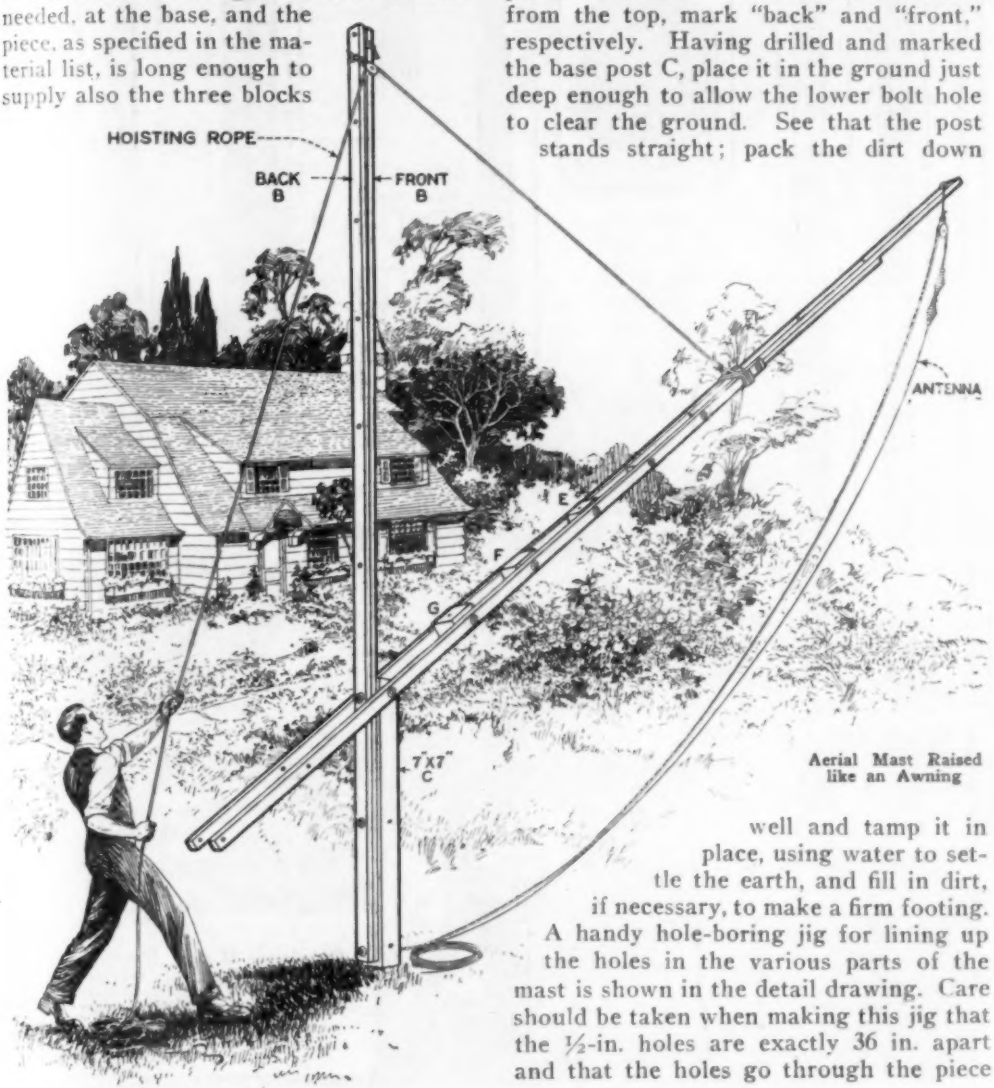
You Can Raise This Aerial Mast Alone

By HENRY S. LARABY

SIMPLE to build, strong and easily raised, this aerial mast is neat in appearance, and the materials required are not expensive.

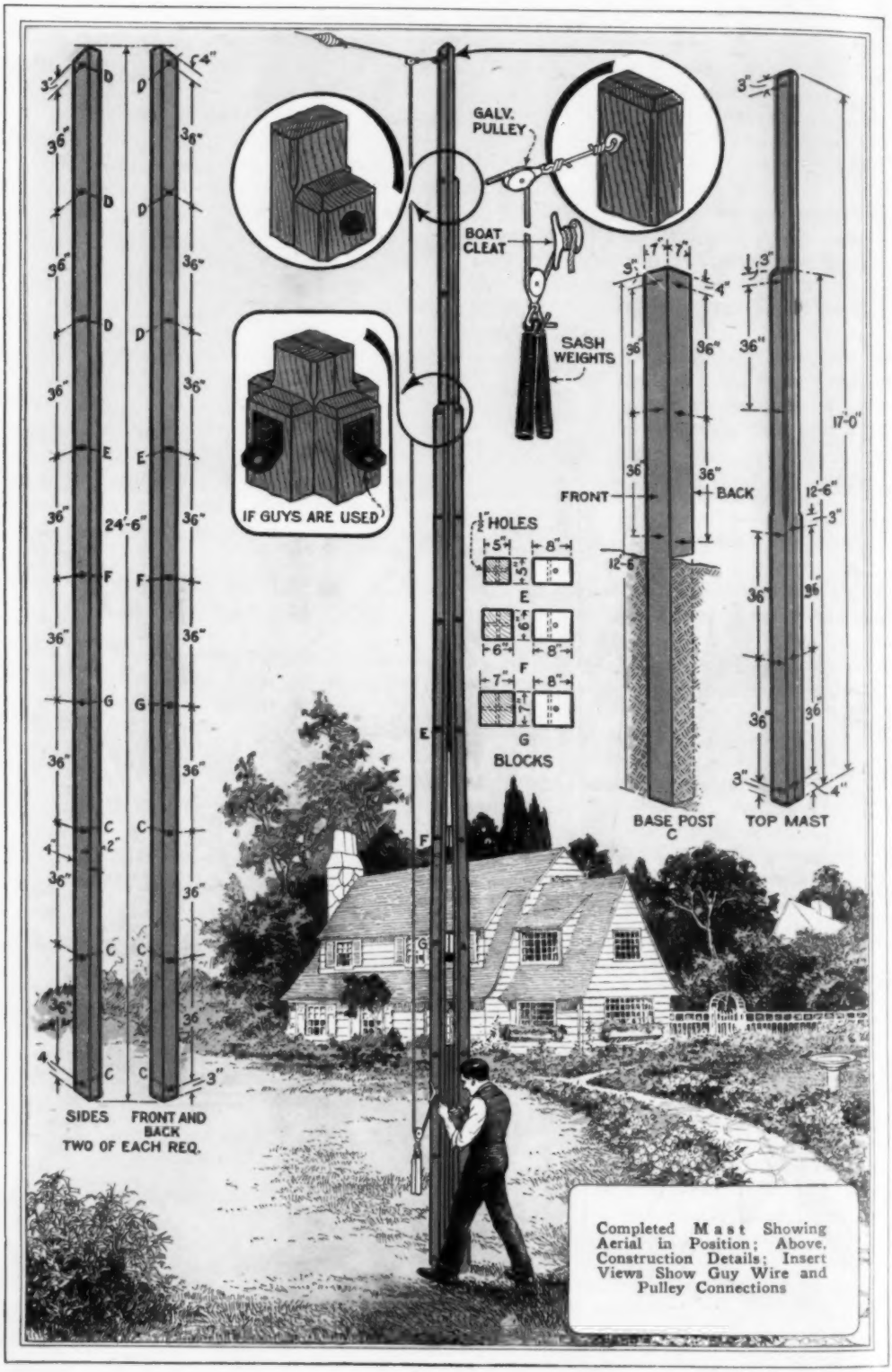
The completed mast is 35 ft. high, which is sufficient for good results; it is also strong enough to withstand a heavy gale without guy wires, although these can be used if desired. The materials are easy to obtain, all lumber being of standard sizes with the one exception of the post C, which is 7 by 7 in. This size is used to increase the strength where it is most needed, at the base, and the piece, as specified in the material list, is long enough to supply also the three blocks E, F and G, or they may be ordered cut at the mill if desired. These blocks are 8 in. long and need not be tapered.

The lumber should be free from knots and planed smooth so as to take a good coat of white paint. The holes are all drilled first and, when painting, allow the paint to run all the way through the bolt holes. After the paint is dry, mark each piece for identification; on the two side-pieces that have the bolt holes nearest the top, mark "side," and on the two side-pieces that have the bolt holes farthest from the top, mark "back" and "front," respectively. Having drilled and marked the base post C, place it in the ground just deep enough to allow the lower bolt hole to clear the ground. See that the post stands straight; pack the dirt down well and tamp it in place, using water to settle the earth, and fill in dirt, if necessary, to make a firm footing.



Aerial Mast Raised like an Awning

A handy hole-boring jig for lining up the holes in the various parts of the mast is shown in the detail drawing. Care should be taken when making this jig that the ½-in. holes are exactly 36 in. apart and that the holes go through the piece

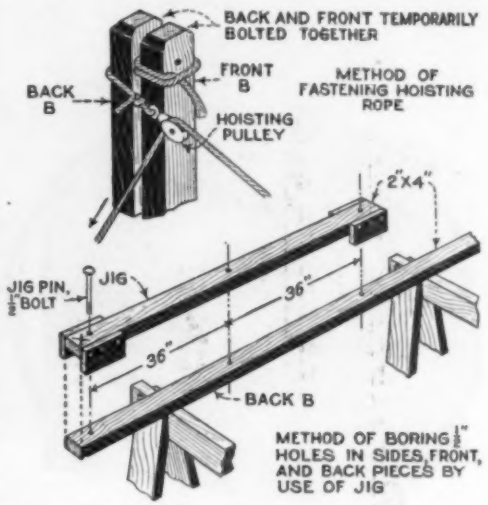


Completed Mast Showing Aerial in Position; Above, Construction Details; Insert Views Show Guy Wire and Pulley Connections

perfectly straight. The jig should be of the same width as the pieces to be bored, so it will not move while the drilling is being done. Mark one end of the jig with an "X," so that this end can be placed in the same position when all the pieces are bored. Be sure the bit cuts a clean hole, and work away from the first hole bored. The holes in the 7 by 7-in. piece can be bored halfway from each side insuring a straight-line hole through the piece.

The piece that has been marked "front" must face in the direction of the aerial wire that is to run from the top of the mast. When the mast is finished, this piece must stand straight up and down against the base when they are bolted together; so, before going farther, make sure that it is straight, using a level if necessary. The two front and back pieces B are then temporarily bolted together, and a pulley is fastened to the top of these pieces with a piece of rope, as shown in the detail drawing. The end of a 60-ft. braided clothesline is threaded through this pulley. Now set the pieces upright against the back of the post C, as shown in the drawing on page 297, and bolt them to this post temporarily. The short rope holding the raising pulley is looped around the back piece at the top, so that the strain of raising is equally distributed on both pieces.

The next step is to assemble the side-pieces and top unit; the former are bolted to the blocks, as shown at E, F and G, while on the ground. The top unit is then assembled and bolted in place; a pulley for the aerial is permanently fastened to the top of this unit and the halyards threaded through it and coiled at the base of the mast, so as to be ready when required. The upper part of the mast is now ready for raising, and is mounted on the base post with one bolt and hoisted into position. Now run the other two side bolts through the base post, and then remove the back piece B from its temporary position, freeing the raising pulley which falls to the ground. The back and front pieces B are then bolted in place in front



and back of the base post, giving added strength to the assembly. Paint the bolt heads and nuts to prevent rusting, and the mast is completed, and ready for the aerial.

If you do not wish to use more than one mast, the other end of the aerial can be fastened to some high part of the house or other high position near the point where the lead-in wire is to be taken to the set. A boat cleat is screwed to the base post at a convenient height for fastening the halyard after the aerial wire has been drawn taut. It is suggested that two sash weights, fastened to a small pulley, be used in the manner shown in the full-page illustration. This keeps the aerial tight at all times, yet allows sufficient slack to prevent the wire from breaking in high winds. This device also prevents swaying of the aerial, a common trouble.

MATERIAL LIST

4 pieces, 2 by 4 in. by 24½ ft., yellow pine.
1 piece, 7 by 7 in. by 14½ ft., yellow pine.
1 piece, 2 by 4 in. by 17 ft., yellow pine.
1 piece, 2 by 4 in. by 12½ ft., yellow pine.
1 piece, 5 by 5 by 8 in., yellow pine.
1 piece, 6 by 6 by 8 in., yellow pine.
1 piece, 7 by 7 by 8 in., yellow pine.
8 ½ by 12-in. galvanized carriage bolts.
10 ½ by 10-in. galvanized carriage bolts.
2 ⅜ by 3-in. galvanized eyebolts.
2 galvanized pulleys.
1 piece galvanized wire, No. 12 gauge, 3 ft. long.
75 ft. ⅜-in. rope for halyards.
60 ft. cheap clothesline.

Tools Required

Crosscut saw, square, rule, monkey wrench, level, brace, ½ and ⅜-in. bits, hammer, spade and plane.

Combined Tube Rejuvenator and Tester Boosts Tubes and Checks Result

Tube Rejuvenator and Tester

A tube rejuvenator combined with a tester, which tells the operator when tubes need boosting, checks the emission improvement during treatment and determines the filament emission afterward, takes the guesswork out of this very helpful operation. It can be used with any of the UV, UX, C or CX-tubes and is made in two types, one for 50 to 60-cycle supply and the other for 25 to 40-cycle frequency. The instrument is 6 by 7½ by 5 in. high, weighs 4¾ lb. and is provided with a handle for carrying.

"Canned" Units Feature Latest Set

"Canned" coils and balanced capacities are features of several new sets. The six-tube receiver shown in the illustration is a notable example of this method of construction and has many features of interest. The past year has shown great activity in the development of tuned radio-frequency circuits. In the early stages of this development, it was the general opinion that this type of circuit was limited by the capacity coupling between the elements of the tubes. Many methods of overcoming this trouble were tried out and one of the best solutions found was the application of the Wheatstone-bridge principle in balancing the capacities. A simple variation of the bridge is employed in the set here under consideration and the method is further improved by the use of high-efficiency coils completely inclosed in metal shields or "cans." The result is a receiver highly selective, having increased amplification without the howling and squealing that previously limited the amount of amplification obtainable; the shielded coils render the energy pick-up from powerful near-by stations almost negligible. Other interesting features are the semi-shielded condensers of special design. Each condenser is inclosed in a transparent dust-proof case, and the panel lights over each dial make tuning in dimly lighted rooms much easier. The receiver has been tested by Popular Mechanics Radio laboratory on a 30-ft. inside aerial, bringing in Texas, New York, Colorado and Louisiana stations, through locals, with clarity and good volume.

Interior View of the Set, Showing "Canned" Coils and General Layout of the Receiver; Notice the Panel Lights over Each Dial to Make Tuning Easier in Dim Light

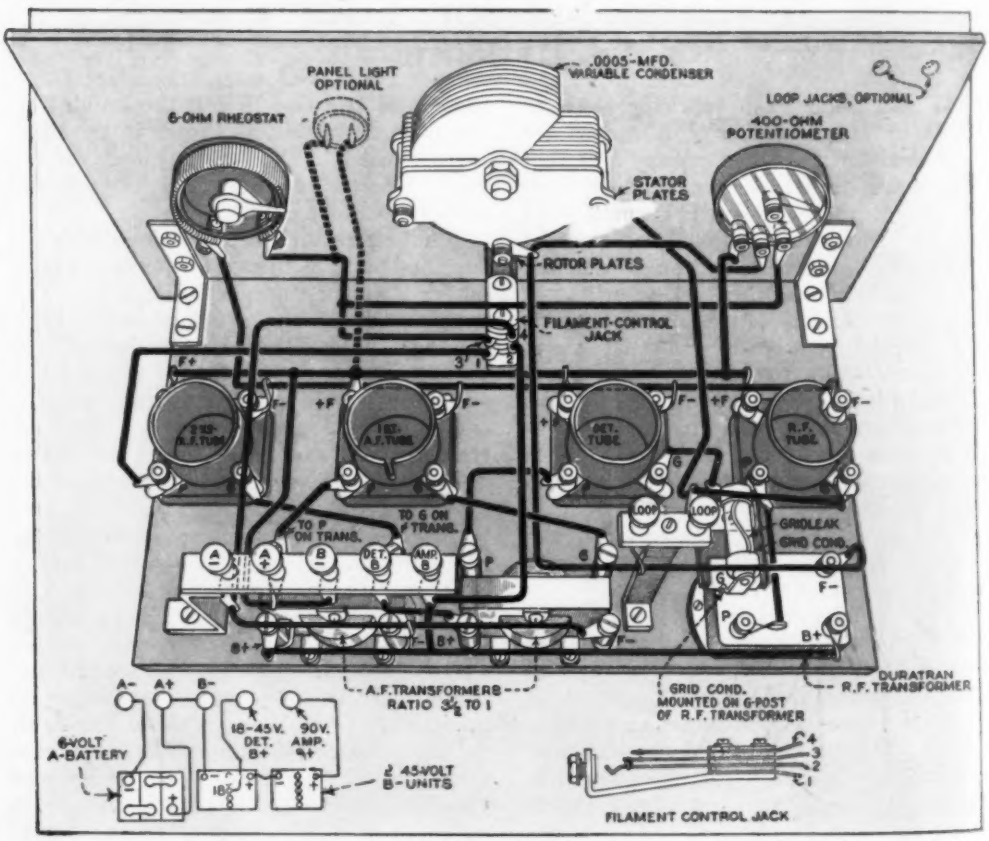
A Radio Set for Your Car

By J. B. SMITH

A REAL good radio set for the car must meet several conditions not found in all sets; it must occupy a limited space, work on a loop aerial, and deliver enough volume to operate a small loud speaker. The author looked for a set of this kind for some time and finally decided to try the four-tube loop set described in Popular Mechanics Magazine of August, 1925. The results were so good that I think it is worth while to pass the idea along to others who would like to try it out. Standard parts are used that can be obtained from any dealer in radio supplies and the set is simple to build. Four 201A tubes are used and the 6-volt battery in the car furnishes the A-battery for the filaments of these tubes. No radical changes were made in the original hook-up, and the layout of the parts is practically the same. The original diagrams are given with the few changes made, and those who have built the set can make the same changes and obtain still better results. The panel light is optional and the dotted lines indicate the proper connections if it is used; a small light of this type is useful at night when the set is operated in the car. The panel and subpanel can be of any size to suit the builder, or the original layout, as shown in the illustration used. This will depend on the type of parts, but the original layout will answer in most cases.

The best results were obtained with the specified parts as they are especially adapted for a set of this particular type. The sockets are of the shock-absorber type, "sponge-rubber" cushion preferred, the variable condenser is the old straight-line wavelength kind and the potentiometer is the noiseless, graphite type. The a.f. transformers can be of any good make, 3½ to 1 ratio; the r.f. transformer is of the type specified and must be used for best results in this particular circuit. Note that the grid condenser is mounted on the grid post of this r.f. transformer and is provided with spring clips for the gridleak. The loop binding posts are mounted on a strip of bakelite screwed to a small brass bracket. The loop leads can either be taken out through the back of the cabinet from these posts, or flexible leads from the stationary and rotor plates of the variable condenser taken to loop jacks mounted on the front panel at the points indicated, and the loop posts eliminated.

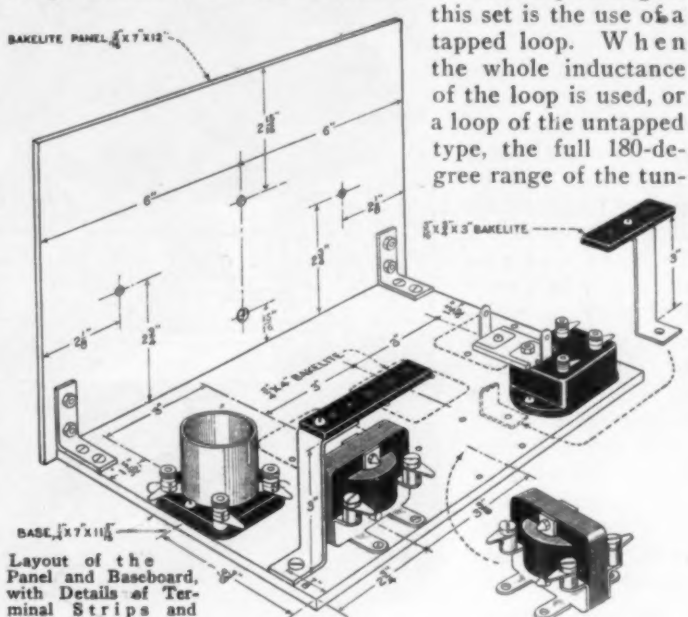
The wiring diagram is so plain that it needs little explanation; the construction of the filament-control jack is shown below and the blades numbered to correspond with the numbered connections in the wiring diagram. Plugging in the horn or phones automatically lights the tubes and places the set in operation. This jack is mounted directly below the variable condenser, but can be shifted to either side, and the condenser lowered if you wish to place the panel light directly above the condenser dial. The ordinary battery connections are shown below the wiring diagram; the two 45-volt B-batteries are placed under the back seat of the car as shown in the photo. Well-insulated leads from these batteries are twisted together and run under the carpet along the edge, to the socket half of the multiplug, shown in the lower photo, which is placed in the corner below the back of the front seat. The A-battery leads taken from the car battery terminals, should be of heavily insulated battery cable, and preferably run through loom. These leads are then taken up through a hole bored in the car floor and soldered to the multiplug socket. The multiplug cable is made up of various colored wires that are taken to the terminal posts in the set through a hole drilled in the cabinet. The plug and socket are marked so that the correct connections are made when the plug is shoved in the socket, connecting both A and B-batteries. This type of battery connection is also handy when the set is to be used in the house on another set of



Wiring Diagram Showing Lugs under All Terminals to Be Soldered; Below, Battery Connections and Details of Filament-Control Jack

batteries. The loop can be any small tapped type, and is mounted in a convenient position on the top of the cabinet; flexible leads from the loops are connected to loop-plugs and plugged into the loop-jacks as shown in the illustration.

The cabinet for the set can be of the standard type, or homemade as was the case with the one shown in the illustration. It is mounted on the back of the front seat by means of two shelf brackets of the type ordinarily found in the five and ten-cent stores. The loud speaker can be one of any of the small types on the market and is mounted up in one corner of the car at the rear, and does not show in the photographs. The horn cord is tacked along the inside of the car so as to be out of the way and brought down to a point near the set. The horn plug is fastened to the cord and when the set is not in use this plug can be dropped into one of the side pockets of the car. The set tunes very sharp and the loop must be rotated in the direction of the sending station for best results.



Layout of the Panel and Baseboard, with Details of Terminal Strips and Brackets

To operate the set, plug in the horn and turn up the rheostat. Then slowly rotate the condenser dial until a station is picked up. Volume and clarity are obtained by adjusting the potentiometer, and with a little practice really remarkable results can be obtained. Keep the rheostat turned down as low as possible for best results, and be sure to remove the horn plug when the set is not in operation. One reason, of course, for the sharp tuning of this set is the use of a tapped loop. When the whole inductance of the loop is used, or a loop of the untapped type, the full 180-degree range of the tuning condenser varies between wavelengths of 370 to 550 meters; when the center tap is used on a tapped loop the condenser range varies between 150 and 400 meters. This method of tuning not only brings in the lower waves better, but completely cuts out the higher-wave stations; at the same time separating stations by several points more on the dials than in the usual way.

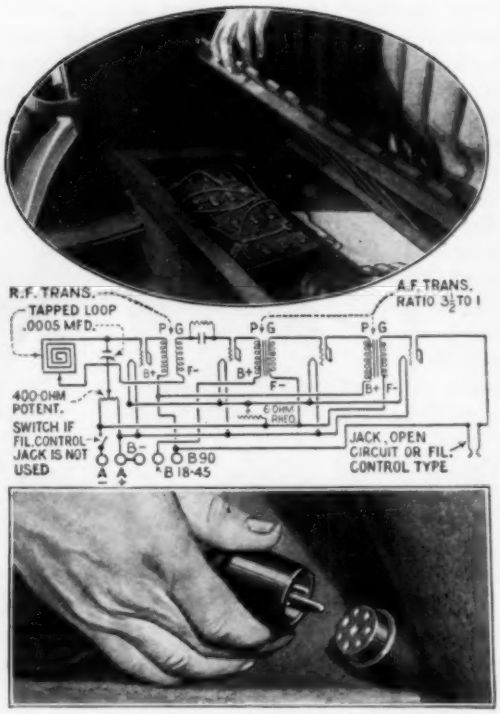
When located several miles from the broadcasting station, the dial has to be set right on the dot to bring the station in, and so, of course, a good vernier dial is essential to the successful operation of

MATERIAL LIST

1 tapped loop.
1 7 by 12-in. cabinet.
1 7 by 12-in. panel.
1 7 by 11½-in. baseboard.
1 low-loss variable condenser, .0005 mfd.
1 vernier condenser dial.
1 400-ohm potentiometer (Centralab or similar type).
1 6-ohm rheostat.
1 filament control jack.
1 .00025-mfd. grid condenser (with gridleak clips).
1 2-megohm gridleak.
4 standard sockets (shock-absorber type).
2 a.f. transformers, ratio 3½ to 1, any good make.
4 201A or 301A tubes.
7 binding posts.
2 small angle brackets for mounting front panel.
2 large shelf brackets for mounting cabinet in car.
1 Jones multiplug, type BP.
2 cord-tip jacks and plugs.
2 45-volt B-batteries, large flat type.
4 oval-head nickelplated screws.
3 two-foot lengths round tinned-copper busbar wire.
1 bakelite strip, 3-16 by ¾ by 4 in. (for battery terminals).
2 4½-in. brass strips, 1-16-in. stock, ½ in. wide.
1 Duratran r.f. transformer.

the set on distant stations.

Some practice in tuning is necessary before maximum results can be expected, but if the set has been carefully built, and the parts specified used, the results will be very satisfactory. It can be moved from the auto to the house in a very few minutes without the usual fussing with battery connections. The battery plug in the floor board can be left connected or not as desired, but for the sake of safety it can be disconnected when the car is not in use. If you wish a blueprint to work from, showing detailed wiring diagrams, you can obtain it for 15 cents, to cover the cost of mailing, from Popular Mechanics Radio department, 200 E. Ontario st., Chicago, Ill. Specify blueprint No. 113.



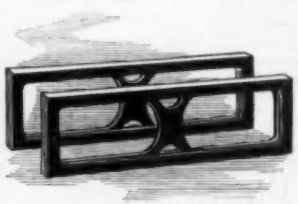
Above, Car Seat Lifted to Show Position of B-Batteries; Below Multiplug for All Connections

Forestalling Radio Troubles

Every radio-set owner can be his own service man and save bills. The necessary equipment is very simple, and, if best results are to be maintained, it is a good idea to thoroughly overhaul the set at least twice a year. The following simple tools are needed: A small double-scale voltmeter, a screwdriver and a pair of pliers, a 2-in. camel's-hair brush, some pipe cleaners, such as are used to clean the stems of ordinary smoking pipes, and some fine sandpaper. Remove all dust from between the plates of the condensers with the pipe cleaners, and from other parts of the set with the camel's-hair brush. All terminals should then be tightened; corroded or dirty terminals should be loosened, and the wire and terminal thoroughly cleaned and brightened with the sandpaper. They should then be tightened until good contact is assured. The batteries should be tested by means of the voltmeter. The tubes should be turned on during this test. Dry-cell A-batteries should test 1.1 volts or more per cell, and the dry-cell B-batteries should test 17 volts or more per 22½-volt block, or 34 volts or more per 45-volt block. Storage A-batteries testing less than 1.8 volts per cell should be recharged. It is well to have several new tubes on hand for comparison with the old tubes. Old tubes that have lost their ability to give good results should be rejuvenated, if possible, or replaced with new ones. The aerial should be gone over to see that all connections are tight and that there are no breaks in the wires. If slack, the wires should be tightened. Last but not least, see that the ground connection is tight.

Non-Metallic Subpanel Brackets

Non-metallic subpanel brackets are now offered to the radio builder. They are made of a strong insulating material, so that wires may touch them or be run through or near them without danger of short circuits and disturbing capacities. They are tested for structural strength, and the neat and efficient design with elimination of unnecessary metal in the fields of the various coils and condensers are of interest.



Here Are Radio's Latest Novelties

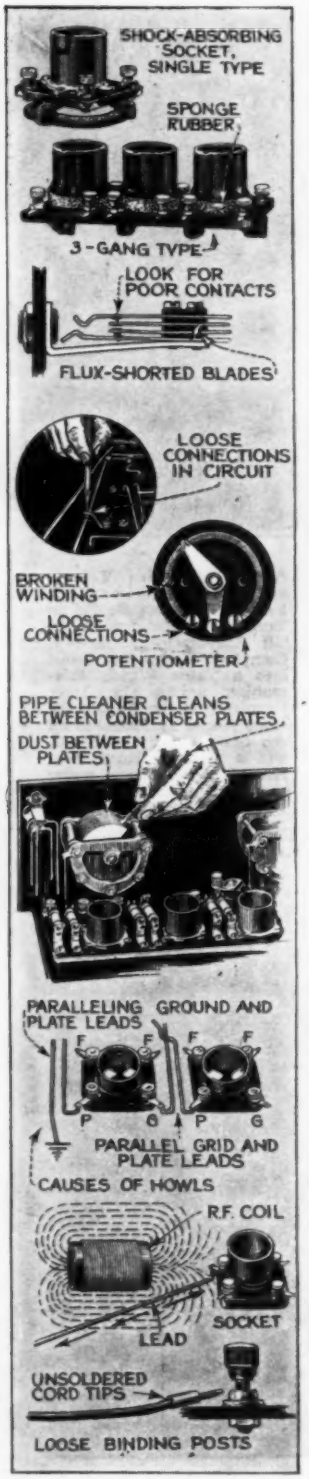
Irving P. Wolfe, of New York, with His Radio Set Built in Lamp

Above, Ushichiro Tokumi and His Radio Clock Switch That Can Be Set to Turn the Radio Set On or Off Automatically; Left, Complete Radio Set Built into a Table Which Harmonizes with the Other Furniture in the Room; the Loop Aerial Is Mounted on the Shelf under the Table, and a Cabinet Horn, Not Shown in the Photo, under the Instrument Panel or on the Table, as Desired

David R. Lowe, of Berlin, Demonstrating New Radio Tube Combining Detector and Two Stages of Amplification; Tuning Coils Complete the Set; Left, Tube Showing Six-Prong Base

What's Wrong with Your Set?

By FLOYD GRAHAM

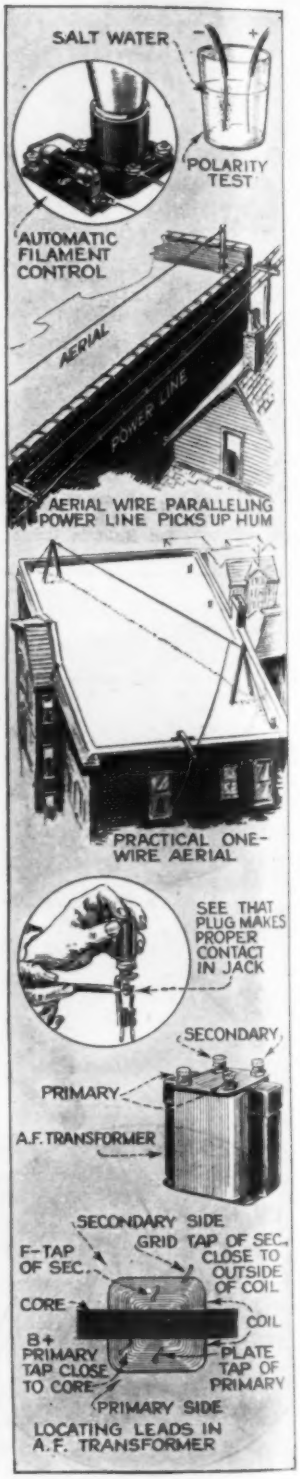


HAVING disposed of the general difficulties commonly met with in detector circuits and sets of the one-tube type in the July issue, we will now consider the amplifier and sets of the multitube type, and their troubles.

Carefully examine the jacks and see that the blades make proper contact, cleaning them so that no small particle of solder or flux remains to short the blades. Search all wiring for loose connections, as two wires merely touching each other do not make a good electrical contact. Wires should be joined to busbars by bending them around the latter for a good mechanical joint, then carefully soldered. A connection of this type offers a minimum of resistance to the current. To simply put two busbar wires together and solder them means not only mechanical weakness, but also high resistance, as solder alone is not a good conductor.

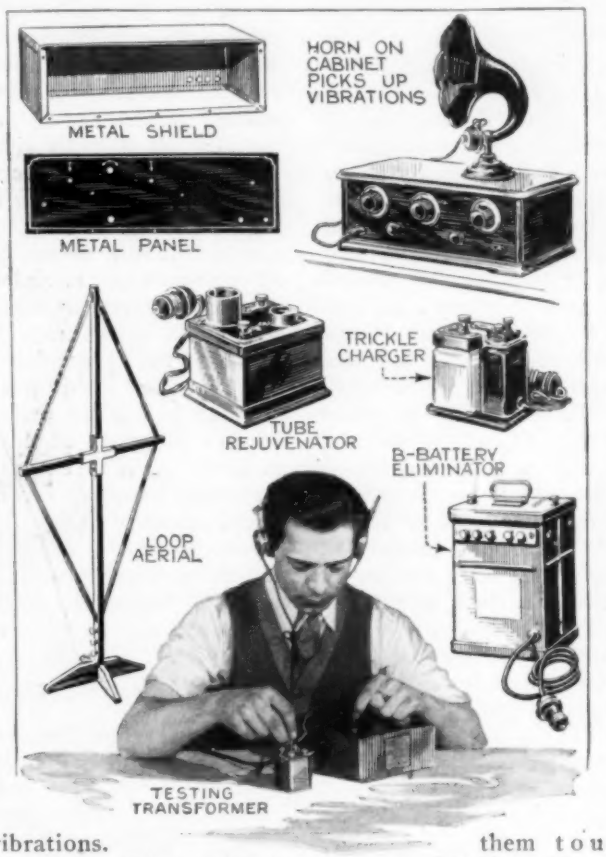
Ground and plate leads that run parallel cause howls, and so do parallel grid and plate leads. An example is shown in one of the marginal illustrations. Other sources of howls and noises are shown, and the reader should check carefully and note if any of the conditions indicated exist in his set. Radio-frequency coils of the solenoid type are surrounded by a field of energy that has a tendency to stray to any wires or instruments within reach. These coils should be kept at right angles to other coils or wires in the circuit, so that such fields will be kept within reasonable and safe bounds.

Dust between condenser plates is another common source of trouble, and an ordi-



nary pipe cleaner can be used to keep the plates free from it. Potentiometers are wound with very fine wire and breaks sometimes occur; if this happens, put in a new one. Keep all terminals tight. Loose cord tips mean high resistance resulting in losses; hence they should be carefully soldered or plugs of the screw-type used to reduce the loss.

Humming or microphonic noises in the horn are sometimes noticeable when the set is jarred or when someone walks across the room, causing vibrations which are taken up by the tubes, or the vibrations may be transferred from the set to the horn, if the latter stands on the same table. Sockets of the spring-suspension or rubber-cushioned type will prevent tubes from vibrating, and a new tube, just marketed, is especially designed to prevent this trouble. Its base is made up of two parts, separated by a tough sponge-rubber section that efficiently takes up such vibrations.



If an outdoor aerial is used, see that it does not parallel any high-tension lines and keep it as nearly at right angles to any such line as circumstances will allow. A well insulated, one-wire aerial of the type shown is ideal for radio reception and will give even better results than an aerial made up of a number of wires with more joints and other possibilities of poor connections. It is a good idea to make no soldered connection to the lead-in wire, but have the aerial and lead-in in one piece. It can be threaded through one end of the insulator from which the lead-in is to be taken and a turn or two made around the horizontal section of the wire to prevent slipping, the lead-in wire being continuous down to the set. Loop aerials that have high resistance give poor results. Even one of the best may be found defective in this respect. The only remedy is to exchange it for a good one or rewind it with a good grade of stranded loop wire, obtained at the radio store.

When connecting batteries watch the polarity carefully, for the battery current must go through the set in the proper direction or it will not work. Most modern battery terminals are plainly marked for polarity but if this marking is lacking or has become illegible, a simple test is the following: Add a pinch of salt to a glass of water, bare the leads from the battery and hold them in the solution without letting them touch each other. Bubbles will appear more abundantly at the end of the negative lead.

Automatic filament-controls for amplifying tubes are now in common use and eliminate many unnecessary rheostats. However, if defective, they will permit either too little or too much current to flow to the tube and cause trouble. Therefore, it is a good plan to have several of varying resistances on hand, that can be clipped in temporarily for test, until the one that works best is found.

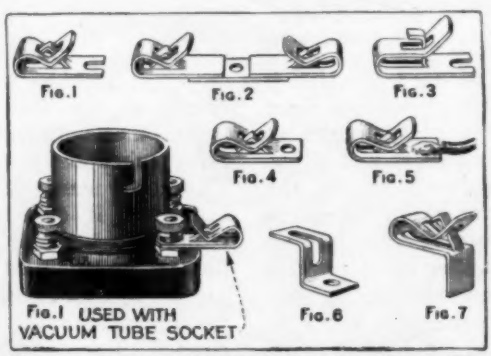
Horn and phone plugs may not make good contacts with the blades of the jack, and a small flashlight is handy for examining such connections. Some of the earlier and cheaper plugs and jacks caused a great deal of trouble in this respect, so be sure yours are efficient.

In rare cases, a. f. transformer terminals are not marked, and the radio builder is at a loss to know which is which. A standard type of transformer is illustrated in its original case, and with the case removed to show where the various leads will be found. This arrangement holds good for any transformer of this type, and the terminals can be marked for identification. Also, these transformers sometimes burn out, and the open winding will immediately cause a sharp drop in volume. The break can be located by slightly wetting the tips of two fingers and placing one on each transformer terminal, thereby establishing a grid return for the blocked tube and thereby partly restoring the volume. A better method is given in the illustration, which shows the operator testing for an open winding with headphones and 45-volt B-battery in series with the suspected winding. If no click is heard in the phones, the winding is open. Sometimes open windings are caused by corroded connections at the terminal posts, or the soldered connection to the coil end may have been broken by turning the posts. In such cases, the break can be easily remedied but if it is deep in the winding, it is better to replace the transformer than hunt for a break.

B-battery eliminators have now passed the experimental stage and are practical if used under the proper conditions. A-battery eliminators are still in the experimental form and with a very few exceptions are not in general use. The little trickle charger shown in the illustration is very popular with users of dry-cell-tube sets, as it will keep the 4-volt A-battery charged and requires little attention, but is not adapted for charging larger storage batteries, although if a limited number of the large tubes are used, and the set is not operated over long periods, it can be used with good results.

No set will work well with old and defective tubes. If your tubes are of the type that can be rejuvenated, which your dealer will tell you, the little instrument for this purpose shown in the illustration should be part of your equipment. It is not expensive and if the tubes are not too far gone, they can be brought back to nearly their original efficiency. The instrument shown is one of the several similar types that may be used for either the dry-cell or storage-battery tubes, and works from the 110-volt 60-cycle circuit.

Last but not least, are you troubled with body capacity affecting the accurate tuning of the set? This form of trouble is not so common now as in the past, owing to improved parts, and the use of metal shielding. Metal panels are now available as well as knockdown metal linings designed to fit the standard cabinets. These are shown in the illustration. The panels may be had in drilled and decorated designs for some of the popular circuits, as well as plain; they are supplied with insulated bushings for mounting the instruments so that part of them comes in contact with the metal panel. Shielding of this type improves the performance of any set. These last suggestions are given as general advice, not as trouble data.



Clips from Discarded B-Batteries Make Handy Connectors for the Experimental Hookups

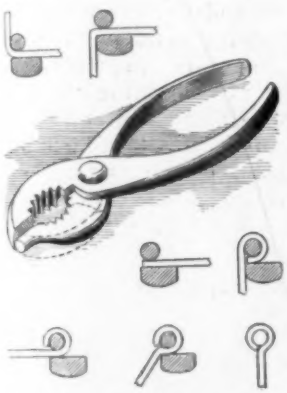
Uses for Old Battery Clips

Terminal clips from discarded B-batteries are useful in many ways in the construction of radio sets, and especially in experimental hookups. The clip can be drilled or filed as shown in Figs. 1 and 4 for use on vacuum-tube sockets as shown. Fig. 2 shows how two clips may be soldered to a narrow strip of brass cut from a third clip, a

hole being drilled through the center for a mounting screw. This double clip makes an excellent multiple connector. The clip in Fig. 3 is formed to make a coil mounting, handy in holding coils in accurate positions, and in Fig. 5 the clip is shown as a quick connector for loop-aerial leads. The tongue is first removed from the clip shown in Fig. 6, and the clip then drilled and shaped to make a permanent coil mounting. The same idea can be employed in making a subpanel bracket. A permanent connector for coil terminals and similar leads is shown in Fig. 7. An assortment of these clips will come in handy, especially to the experimenter who wishes to try out various circuits.

Wire Bender Made from Pliers

A handy wire-bending tool can be made from a pair of common gas pliers by grinding one jaw down to the shape indicated by the dotted lines in the illustration. The legs are separated and one of the jaws ground down to half its original thickness and to the shape shown by the full lines.



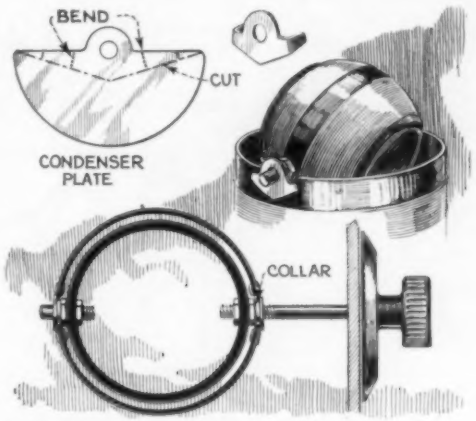
This should leave the tip 5/32 in. in diameter for a distance of about 3/16 in. The shaded portions in the detail drawings illustrate the tip of the tool after it has been assembled, and the position of the bus-bar wire during the bending operation. The upper sketches show the way to obtain a rounded or sharp bend, and the lower how to form a loop to go over a terminal post.

Stenographers Use Radio for Practice Dictation

Stenographers who wish to increase their speed in taking dictation are listening in on radio speeches sent out by the various broadcasting stations. Often the speech will appear in the newspaper so they can check their transcription.

Rotor Mounting Easily Made from Condenser Plate

Many radio experimenters find it difficult to mount rotor shafts on cardboard

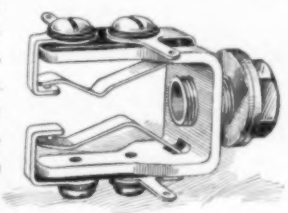


Mounting Collar for Rotor Unit Is Cut from Old Variable-Condenser Plate

tubing; this difficulty can be overcome by the method shown in the illustration. A rotor plate from an old variable condenser is cut along the line indicated in the upper illustration, and bent to the shape shown at the right. The prongs are thrust through the tube to hold the collar in place, and the shaft will then turn easily in the hole. The lower illustration shows the method of connecting the rotor shaft to the rotor unit. The dial is mounted on the end of this shaft in the usual manner. —Hubert A. Vachon, Haverhill, Mass.

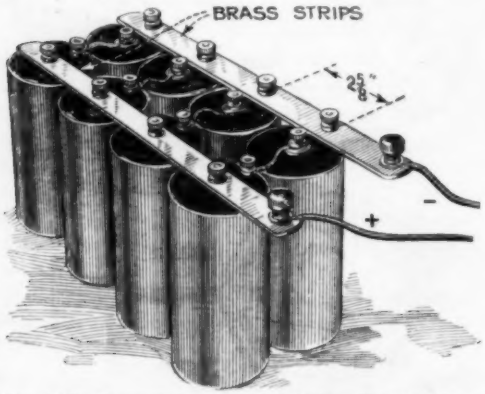
One-Inch Jack Needs Small Space

Jacks of novel design have lately made their appearance on the market. They are well made and take up very little room as they are only 1 in. long, lending themselves nicely to under-panel construction. The old type jack originated in telephone switchboard construction and has not before been refined for radio purposes. The new jacks are available in the regular standard types and take the ordinary horn or phone plug.



Metal Strip for Multiple Dry-Cell Connections

When several dry cells are to be connected in parallel, for multiple hookups of many cells, the battery connectors



Dry Cells Connected in Parallel Series, Showing Brass Strips Used for the Parallel Connections

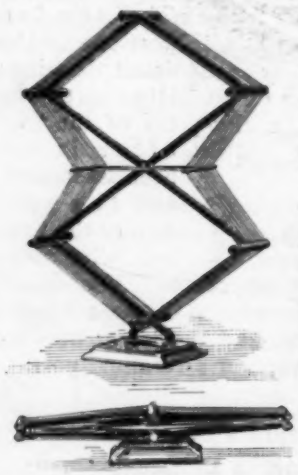
shown in the illustration will be found neat and handy. They are simply strips of brass slightly longer than the combined length of the cells set against each other in a straight line. As many 3/16-in. holes are drilled in the strip as there are parallel terminals to be connected; these holes are spaced 2⅝ in. apart. An old battery binding post is then mounted on the end of the strip. The cells are arranged in the correct position, the strip is placed over the battery binding posts and the nuts screwed on. This serves to hold the cells rigidly together and makes a solid connection.

Making Low-Loss R.F. Transformers

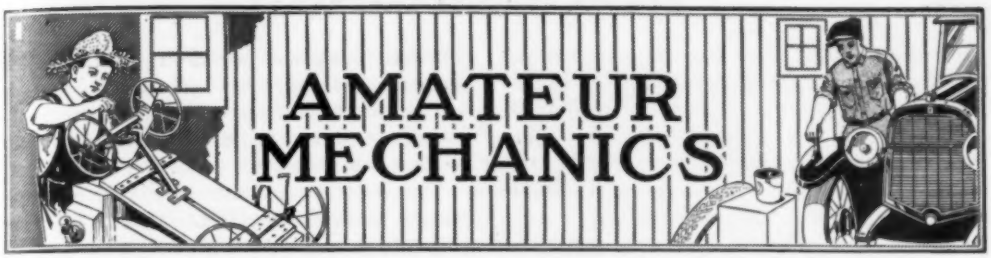
The best kind of r.f. transformers are cylindrical in shape, says the U. S. bureau of standards, after it had conducted exhaustive tests on all the different kinds of coils. To make them extremely low-loss, wind them on a collapsible cylinder and give them a good coating of collodion, which makes them strong. Then remove the coil from the cylinder and mount it on the subpanel by means of a ¼-in. strip of bakelite, a ½-in. screw at each end holding this strip to the subpanel. Now the primary, which is of smaller diameter than the secondary, should be fastened to the center of the strip in the same way as the latter is attached to the subpanel; only ¼-in. screws are used on these and they are tapped directly into the strips holding the secondary. The best location for the primary is in the center of the secondary, as the induction is then evenly distributed. The spacing between the primary and secondary and the number of turns of wire on the primary determine selectivity and volume of signals, and the ratio of the number of turns between the primary and secondary should be about 1 to 10. The larger the primary is, both in diameter and in number of turns, the broader the set will tune and the more volume it will have. This is advantageous for locations quite some distance from broadcasting stations, but in large cities, such as Chicago, it is necessary to have selectivity, which is gained by decreasing the diameter and the number of turns of the primary. If .00035-mfd. condensers are used to tune the secondaries, the latter should have about 54 ft. of wire, which means about 108 turns on a 2-in. diameter. Primary coils, 1½ in. in diameter, having 11 turns, have been found very satisfactory with this size of secondary.

Collapsible Loop

A new collapsible loop that folds and unfolds in small space is shown in the illustration. It is especially adapted for portable sets. The only adjustment necessary to prepare the loop for use is to unfold it by pulling at the top. It will hold any adjustment with all wires taut, and pivots on a hardwood base. When not in use it can be placed in a drawer, or pushed into the lid of a portable set.



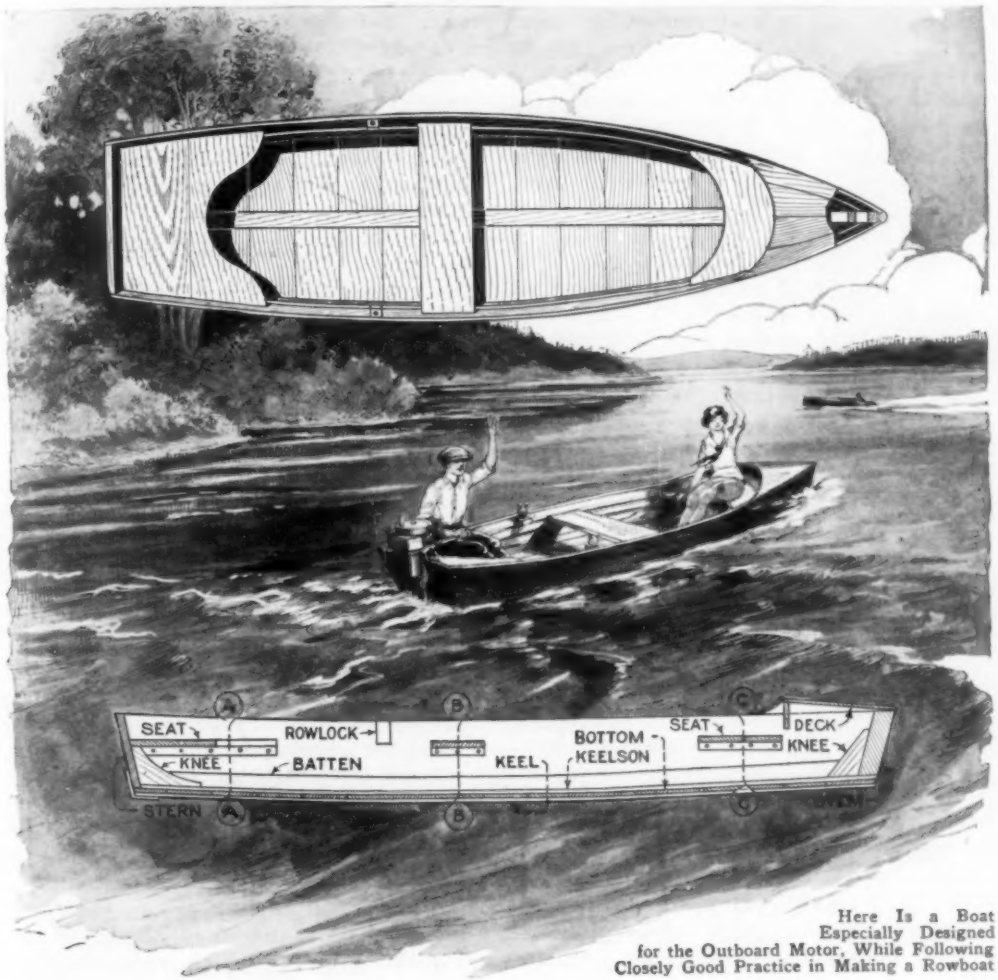
¶Howling is often caused by the plate and grid leads running parallel and too closely together.



A Boat for Your Outboard Motor

By B. FRANCIS DASHIELL

THE average rowboat is not entirely suitable for use with the outboard boat motor. The boat described in this article has been designed for the following: Perfect balance with the weight of the motor on the stern; a substantial stern and parts to carry the weight and hold up against vibration and strain; an easily riding bow that does not ship much water when the going is rough; large substantial seats; a front deck giving a motorboat appearance; light weight; ease



Here Is a Boat Especially Designed for the Outboard Motor, While Following Closely Good Practice in Making a Rowboat

of rowing, etc. The use of a motor on such a rowboat permits the builder to get into the motor-boat class to some extent, and a few of the refinements of the latter are embodied in the design. While this particular boat has been designed especially for use with an outboard motor, still the fundamentals of general rowboat practice have been closely followed.

The sides are two cypress boards, dressed on both sides, ⅞ in. in thickness, 16 in. wide, and 15 ft. 7 in. long, one to each side. No great difficulty should be experienced in obtaining these boards but in some localities it may be necessary to make them up by using two boards; for instance, a 12 and a 4-in. width, doweled along the edges and clamped with a butt strap piece along the entire length. However, this type of construction is not recommended. The boards must be sawed to the shape indicated by the drawing so as to give the proper curvature to the bow and stern. If a band saw is available, the two boards can be shaped together readily; otherwise, a narrow saw and plane must be used, doing the work by hand. Boards of this length will construct a boat 15 ft. in length.

The stem piece is made of oak. The use of this wood lessens the danger of splitting and will furnish a substantial anchor for the screws used in attaching the sides. A piece of oak 3 in. thick, 6 in. wide and about 20 in. long is necessary. Two grooves are cut on the opposite sides, as shown in the drawing, to receive the ends of the side boards. The top and bottom are cut flush with the edges of the sides after they have been placed and this is best done just before the bottom boards are put on, so that a watertight joint may be assured.

The stern is of cypress, not less than 1½ in. thick. It may be necessary, although somewhat poor practice, to build the stern up of two widths, splicing along the joined edges with dowels and a longitudinal butt strap, as well as cross battens. A single width is much to be preferred. The oak knees need be no particular shape, as they are simply braces. They should be about 2 in. in thickness, and used to strengthen the stem and stern. They are attached to the keelson and keel, preferably with bolts passing through these and the bottom. The knees cannot be set in place until the bottom, keelson and keel have been put on. The general shape is indicated in the drawings, but may be altered to suit any special condition.

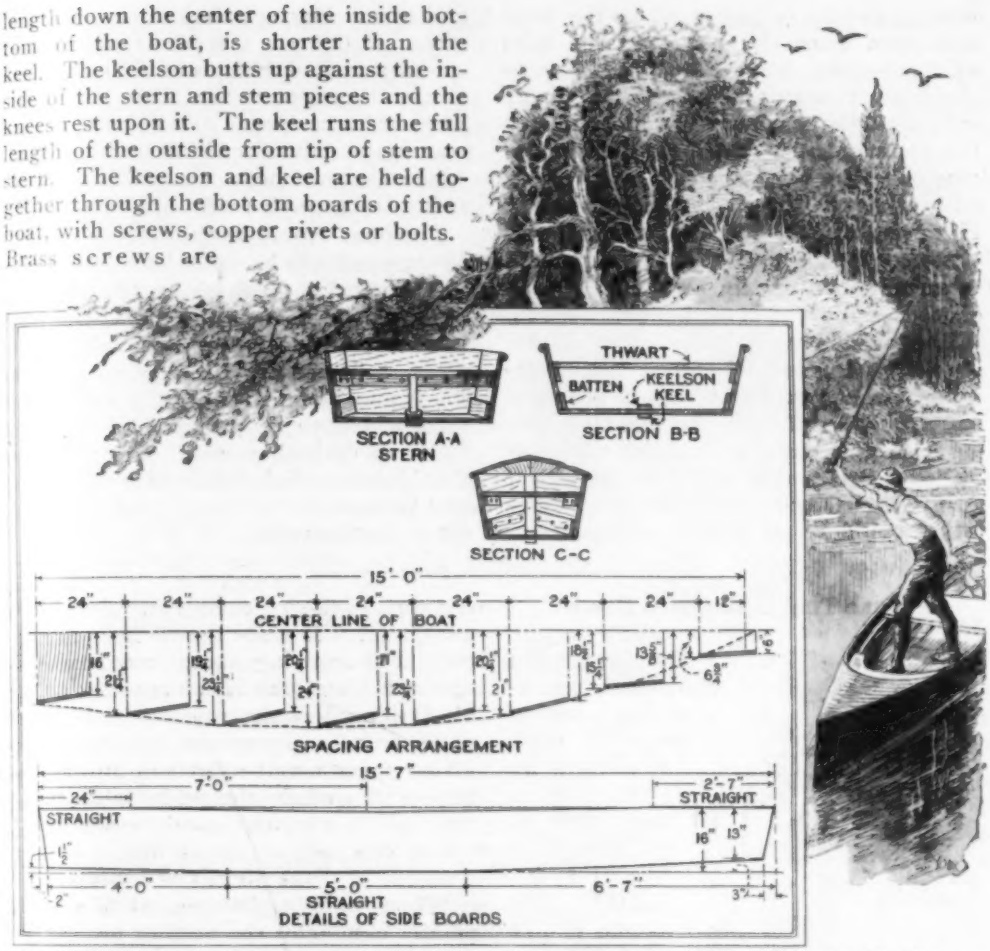
The battens consist of two cypress pieces, each 4 in. wide, dressed to ⅞-in. thickness, and running the full length of the side pieces, except for the thickness of the stern and the depth of the stem piece. One batten is attached along the inner lower side of each side board, and furnishes additional bearing and screwing surface for the bottom boards.

After the sides have been carefully shaped they are placed side by side on their edges, top down. Sixteen temporary cross pieces are cut from scrap material, about 1½ in. wide and ⅞ in. thick; eight for the top spacing and eight for the bottom. Nail the bottom cross pieces to the side boards at their respective positions as indicated in the drawing (spacing arrangement). Turn the whole over so that it rests on the temporary cross pieces and nail on the top spacing pieces. When this has been done the sides will then assume their proper curvature. If there is any apparent lack of symmetry in the lines of the boat it may be adjusted by releasing the proper cross pieces and re-nailing. The front ends of the sides should now be trimmed off and the stem piece inserted. If the fit is perfect, the sides should be permanently attached with screws. The stern is next fitted and the sides also attached with screws. The bottom is now put on, and the bottom temporary cross pieces should be removed, one at a time, as the screwing on of the bottom boards progresses.

The bottom is of cypress boards, dressed to ⅞-in. thickness and about 10 in. in width. These are attached to the boat, being placed across, and screwed firmly in place; screws being placed in the edges of the side and batten, alternately. The screws should be set in about 1 in. from the sides of the bottom boards and then spaced about 2 in. apart the rest of the distance across. The edges of the bottom boards and the side pieces should be fitted carefully so as to be parallel.

The keel and keelson are of the same size; 3 in. wide and ⅞ in. thick. However, the keelson, which runs the full

length down the center of the inside bottom of the boat, is shorter than the keel. The keelson butts up against the inside of the stern and stem pieces and the knees rest upon it. The keel runs the full length of the outside from tip of stem to stern. The keelson and keel are held together through the bottom boards of the boat, with screws, copper rivets or bolts. Brass screws are



Details of Construction of the Outboard-Motor Boat. This Craft Is Simple Enough for Any Handy Man to Build, with Ordinary Tools

used satisfactorily, in addition to small wood bolts, about 3½ in. in length, spaced about 12 in. apart along the entire length.

The midship thwart should be placed in position so as to give the boat more stability during the rest of the construction, after which the remaining temporary top cross spacers may be removed. The stern seat should be deep enough so that the operator can be seated while the motor is attached. The motor takes up a certain amount of inboard space and, in the average rowboat, the operator is compelled to sit to one side, resulting in an uneven balance. The rear seat should be low enough to allow plenty of clearance for the motor clamps. The bow seat should also be roomy, comfortable and low.

The deck may be arranged in any way desired. It should be somewhat higher at its inner end, so as to shed water. A cross or bulkhead piece is set across between the sides, and used to support the deck. Two of these may be fitted if desired, one just aft of the stem piece.

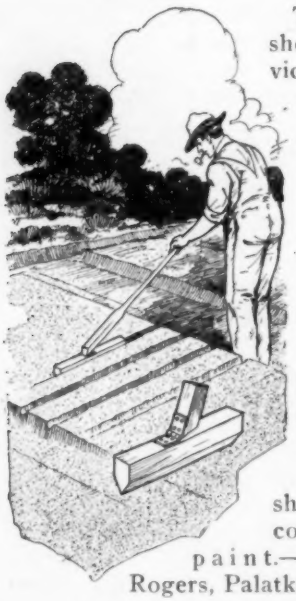
All joints in the stern and stem assembly, along the bottom and between the bottom boards should be made watertight. The surfaces in contact should be carefully fitted, and a good make of marine glue may be used between the surfaces before the parts are drawn up by screws. Thick white lead may also be used. A piece of calking cotton, or any loosely woven material may be placed between the joints. This cotton may be dipped in white lead or placed between joints which have been spread with marine glue. The

calking cotton is best used in the stem and stern assembly and along the sides of the bottom, while the joints between the bottom boards may be filled simply with the marine glue. The screws draw the parts together and force out surplus glue or lead, which, when set, will provide a boat that will stay dry for many seasons. However, unless built of very well-seasoned lumber, no boat will stay tight if it is permitted to remain out of water and exposed to the rays of the hot summer sun.

The outside upper edge of the sides should be finished off with a large half-round strip of molding, or a more elaborate coaming effect can be had by finishing with a flat strip around the top, projecting over the edge and filled in with a strip of quarter-round molding. Rowlocks should be set in the proper places, and brass rings attached to the stem and stern. If desired, a small steering wheel can be placed in the bow with line running around the sides to the motor or rudder. The hardware used in assembling the boat may be of galvanized iron and such galvanized screws, bolts, etc., will serve very well. No excessive sizes are necessary.

The boat should be thoroughly painted. No attempt will be made here to describe any particular finish as every individual has his own ideas as to colors. At least two coats of lead-oil primer should be given, followed by the top color coats which may be finished off with one or two coats of clear spar varnish. If a natural finish is desired, a coat of wood filler should be applied, followed by a shellac coat and two or three coats of good waterproof spar varnish.

Simple Tool Opens Seed Rows



The illustration shows a simple device for opening rows for seed. It is made by hinging a long stick to a beveled block as indicated. The handle must be long enough to allow one to walk in the furrow and push the tool along. It should be given a couple of coats of paint.—Miss Olive M. Rogers, Palatka, Fla.

New Use for Blowtorch

There are many uses for a gasoline blowtorch besides heating the soldering copper and burning away old paint. It will be found handy for spraying a mixture of oil and kerosene between the leaves of your automobile springs, and around the inaccessible spots in the wearing parts of the brake rods and pins, which always seem to elude the jet from the oil-can. For applying liquid insect exterminators a blowtorch is far superior to the old-fashioned squirt gun. The liquid is under an even pressure and the easily regulated spray may be directed into all the tiny cracks where the pests lie hidden.

Drip Catcher for Paintpots

When painting floors, a Wisconsin painter eliminates the need of placing papers on the floor under his paintpot pail by gluing a paper plate to the bottom of the pail, as shown in the illustration. The pail may then be moved about from place to place without annoyance and the drippings caused by laying the brush across the top of the pail, or wiping the bristles on the edge, will be caught on the plate.

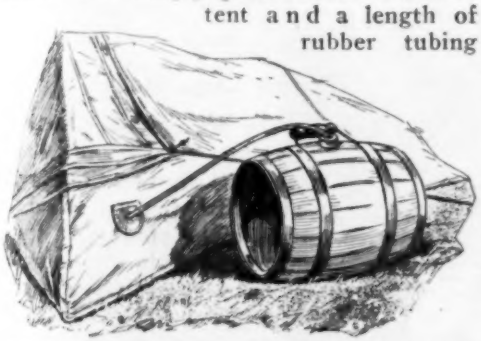
Saving Oil-Stove Wicks

Many oil stoves use a cotton wick held in a perforated cylindrical metal holder, the top of the wick extending above the holder. When the wick has burned down to the holder it is discarded and a

new one put in. As these wicks cost around 35 cents each, and, with this practice, are only worn down about ¼ in., the cost of wicks is quite an item. The expense can be materially reduced in the following way: Take old wicks and remove one wick from its holder without injuring it. Leave the other wick in its holder but cut it off all the way around and about an inch below the top of the holder. The cutting must be done carefully and accurately. Mark with a pencil and use a discarded safety-razor blade if available. Place the old wick removed from its holder on top of the wick just cut down. This gives a new wick of proper length and at no cost except a few minutes' work. The new wick will feed the oil perfectly, if the edges of its two parts are accurately fitted together. If there is any doubt as to this, make sure with a few thread stitches.

Campers' Water Canteen

While on a summer's camping trip and using a small tent having a sewed-in floor cloth, the writer experienced some trouble with the water canteen during sultry nights. Sometimes the stopper of the water bottle became dislodged through the unconscious movements of the sleeper, and it was often a problem how to stow this equipment so that there would be no danger of spilling water on the blanket yet have the water handy. The drawing shows how the problem was solved. The barrel was simply placed outside of the tent and a length of rubber tubing



Rubber Tube Supplies Camper with Water Inside of Tent from Outside Canteen

used as a siphon. A leather washer sewed both inside and outside, around the hole in the tent, prevented wear on the canvas. —Frank M. Small, Tampa, Fla.

A Bathtub Washboard Hook

If a laundry sink is not available, it is sometimes better to wash large, heavy articles in the bathtub than in a small wash-

Handy Hook on Washboard Facilitates Washing Clothes in Bathtub

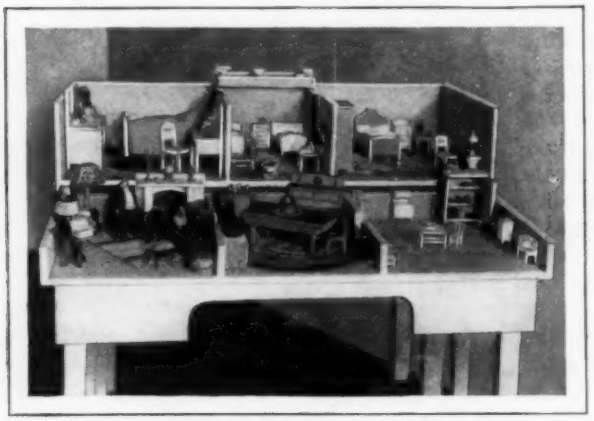
tub, which does not provide sufficient room for handling them conveniently. The hook shown in the drawing engages the edge of the tub and retains the washboard at the proper angle. Without it, the board would slip down too far into the tub. The hook is made of No. 10 galvanized-iron wire. Estimate the length of wire needed, allowing about 6 in., or more, at the ends to give leverage for forming the eyes, which are easily made by bending the wire around a nail, or nails, driven into a board. The excess wire at the ends is then cut off. The hook is formed with a wrench and a hammer.

Cleaning Electric Coffee Pot

An easy way to clean the tube of your electric percolator and to remove any deposit on the inside is to put four heaping tablespoonfuls of salt in the coffee compartment. Use as much water as in cooking coffee and allow it to percolate for the same length of time. Any grains of coffee lodged in crevices will have fallen to the bottom and the brown deposit on the surface of the utensil will be gone, by the time this is done.

Novel Doll House

Two little girls abandoned an elaborate doll house for the table arrangement shown in the photo. They objected to the ceilings of the other house, which hampered them in moving their dolls and furniture about. One of them conceived the idea of having the rooms partitioned off with railings on top of a table. Later a taller table for an upper floor was added. Between the rooms, openings are left in the partitions to serve as doorways. The two tables are made of light pine, so that they can be easily moved about, and being separate, can form either a two-story house as shown, or placed end to end to make one long building. The upstairs partitions are higher than those on the lower table, because there they do not interfere with the child's reaching into the different rooms. The furniture is painted in some contrasting color. Most of the toy furniture was made by boys in the manual-training department of a school. The front of the lower table is cut out so that a stool may be used while playing. This house has been the most absorbing and useful toy these children ever owned.



New Departure in Children's Doll House Partitioned Off on Table Top with Railings

Saving the Rain-Water Barrel

When the hoops rust off and the old rain-water barrel seems ready to fall to pieces, go to the junk yard and get 10 or 12 ft. of old sprocket chain, make it into loops, the size of barrel hoops, slip over the barrel and tighten them securely. These serve as well, stay in place better and will never wear out.—Willis Mehanna, Bussey, Iowa.

Cork Forms Removable Mount for Camera Lens

My reflex camera does not have a removable lens; so, wishing to use a lens of shorter focal length for close work, I provided a cork stopper to mount it on. The stopper was tapered slightly and made a tight fit in the threads on the front board to prevent leakage of light around the edges. The center of the stopper was cut out and smoothed down with a small round file, so that the new lens was a tight fit in the hole. After fastening the lens with small screws, the stopper was given two coats of black ink, both to improve its appearance and prevent reflections to the interior of the camera. By using a lens of which the focal length was not more than one-half of the available bellows extension of the camera, life-size photos of small objects, bugs and flowers could be obtained.—H. W. Rogers, Ithaca, N. Y.

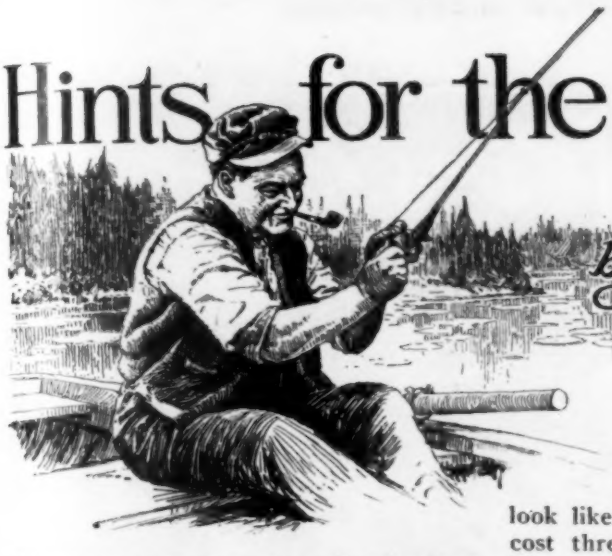
Bicycle Lawn Mower

Mowing the lawn weekly proved too arduous a task for two boys, or at least they thought so, and, therefore, they rigged up the unusual mowing device shown in the photo. It consists of an ordinary grass mower attached to the front fork of a bicycle. The handle of the mower is removed and a short piece of wood of the same width and thickness is substituted. This piece is bolted to the fork at two points.

Boys Attach the Lawn Mower to Bicycle and Make Task a Pleasure

Hints for the Fisherman

by Bob Becker



JUST as the hunter who sallies forth to the game fields must have his gun and outfit in order if he wishes to get the best results, and just as the automobilist must prepare for a tour and carry spare tires and a few tools for repairs, so the fisherman, with designs upon the big ones of his favorite lake or stream, should have his tackle in the best condition if he wants the most fun out of his sport. A loose ferrule that may bring trouble when a fish is played, a poorly wrapped rod tip or a reel that is dirty and not working properly, may spell the ruin of a day's sport with bass, pike, muskellunge or trout and the wise fisherman puts the taboo on these annoyances by a few hours of work before the "battle" with the big fish begins.

If you are planning on fixing up "Old Faithful," your pet fishing rod that has served you on many a trip, here are a few tips on how to make your wooden weapon look like new irrespective of whether it cost three, five, or seventy-five dollars. First, remove the guides by cutting through the windings. An old razor blade or a keen knife will do this trick. Take off the tip and the ferrules. If they do not come off easily application of a little heat to the metal (by means of a match, if nothing else is handy) will easily solve the problem.

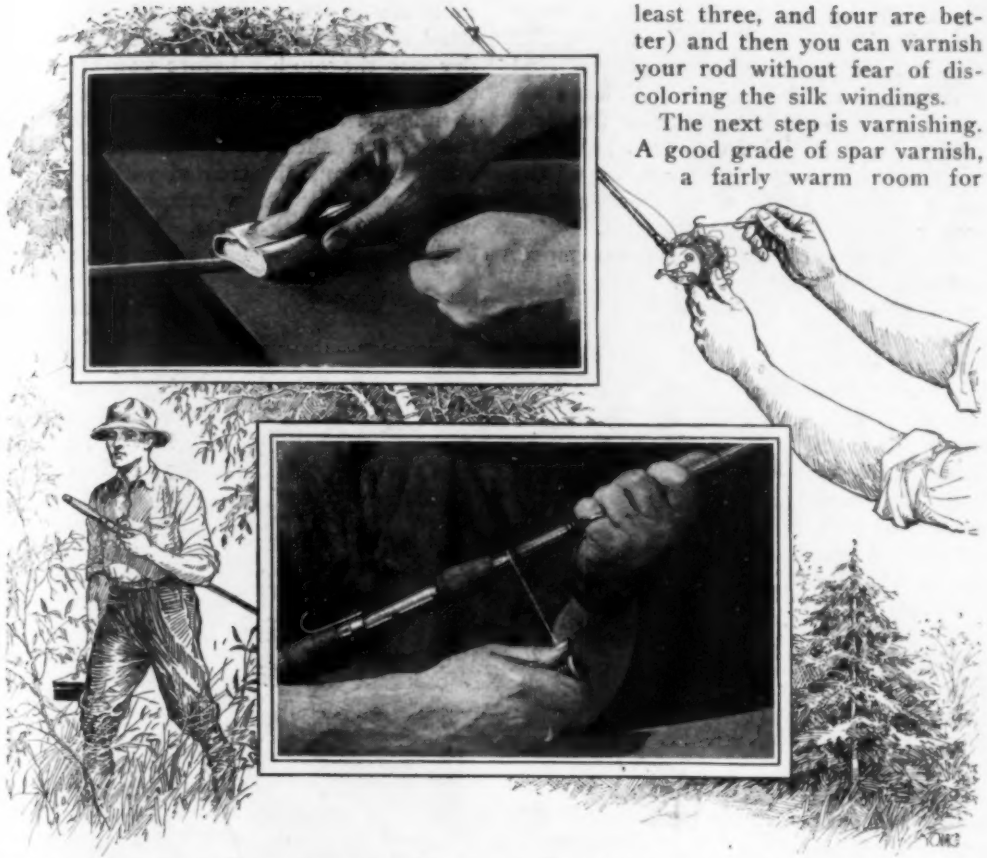
In fixing up a rod for a fishing season it is well to remove all the silk windings and all the varnish. By scraping the stick with a sharp steel edge (I use part of the blade of an old hunting knife taped in two places so that it may be gripped by the hands) the old varnish can be removed easily but one should be careful not to scrape too hard as you must preserve the enamel on the bamboo, especially where the various parts of the rod are joined. If your rod is solid wood like hickory

or bethabara this "manicuring" operation does not need to be done so carefully, as there is no danger of injury to any enamel.

The next operation is sandpapering. Buy the finest sandpaper that you can obtain, find a small flat block of wood, 4 or 5 in. long and about 2 in. wide, spread a piece of sandpaper over this block and then use plenty of elbow grease as you rub down the rod. But don't bear down too hard if you're working on a bamboo rod, as the slogan is, "remember the thin enamel coat on the bamboo must be preserved." After giving the rod a thorough rubbing down, wipe it clean so that it will be shipshape for the next operation. This next step is where many fishermen make a fatal error, as far as the appearance of their rods is concerned. They put on a coat of varnish instead of shellac, which results in a messy job because the color preservative that will be used later on the silk wrappings turns varnish white, and presto!—the job is ruined. So the trick is, apply a light coat of good shellac first and you have a solid foundation to work on.

In cementing the tip and ferrules to the rod, fishermen can use a wide variety of materials. Marine glue, sealing wax or ferrule cement are a few of the ingredients available. We prefer the regular ferrule cement which can be purchased in any sporting goods store. It comes to you a hard, brittle (when cold) stick of wax-like substance wrapped something like a big stick of candy. When you're ready to use it on the rod scrape the wood free of any of the old cement, then heat both the wood and metal, melt a little of the cement, smear it on and then shove the parts on firmly. As soon as they have cooled sufficiently you're ready to proceed with your job.

Winding the rod and fitting the guides are the next items to be tackled. Guides should be placed in position and held there either by thread or small rubber bands. With your gay-colored silk thread wind tightly and evenly toward the agate



which will assure a neat even job. Practically every home rod worker uses the following method in winding a guide. In starting the thread he turns in one end of it so that three or four turns are passed over it (Fig. 1). When nearly finished with the winding the next trick is to throw a loop of thread on the side of the rod (Fig. 2) so that three or four turns can be made over this loop. Then at the finish put the end of the thread through this loop (Fig. 3), pull the end through and cut it.

Every fisherman who owns a fishing rod of wood which is gayly yet tastefully decorated with colored silk wants the windings to look well. To achieve this end note the following suggestions, designed to keep the colors of the silk bright and clear after the varnish is applied. Any drug store can furnish the combination; banana oil and collodion in equal parts. Use a good camel's-hair brush and put on several coats of this color preservative (at least three, and four are better) and then you can varnish your rod without fear of discoloring the silk windings.

The next step is varnishing. A good grade of spar varnish, a fairly warm room for the work, a good brush that doesn't shed hairs and plenty of patience are the big factors in the success of this operation. Put on three or four thin coats, always allowing the rod to dry for several days between each application. If you can keep the rod in a room free of dust it will come out looking like a million dollars and quite ready for some tussles with big fish.

Thousands of fishermen prefer steel rods for their "weapons" while on fishing trips, as these sturdy tools require little or no "petting," and can be abused more than a bamboo, hickory or bethabara rod. As a rule there are no colored silk windings to worry about and hence home work on these steel "whips" is a negligible item. If agate guides are used on your rod the main thing is to examine them closely after the winter storing period to see if they are intact. A cracked agate means a cut line and poor casting.

The reel is an important item in the fisherman's kit so don't slight it when polish-

ing things up for a trip. Take it apart carefully for cleaning. Put a drop or two of the finest lubricating oil on the vital parts and it is ready for use. Tissue paper is much better for cleaning the delicate parts of a reel than rags as the lint from the latter can be injurious to the finely attuned parts of any bait-casting reel, whether cheap or expensive.

After the outfit is cleaned, revamped, polished and all ready for strenuous combat with the finny tribes the fishing clan, which numbers many millions, finds it worth while to keep in mind a few don'ts if the outfit is to stand the gaff, and last for one or more vacations. We might call these "don'ts" the ten commandments for successful Waltonians. They apply to the fisherman with a modest outfit as well as to the angler with hundreds of dollars invested in expensive tackle:

If you're fishing along a river, or on the bank of a lake don't lay your rod on the ground, unless you're sure you are the only fisherman in the territory. Stand the rod against a tree or in some brush so that no one can come along and step on it. Sand (or foreign particles of any kind) in a reel will ruin it. So don't carry your reel loose in your pocket, in the bait box or in a suit case where it may pick up some dirt. We use a small leather case for our pet reel. A small pouch with draw strings is also good and can be made at home at practically no cost. After fishing in the rain dry your rod, reel and line. The reel should be wiped with a dry cloth and a few drops of oil applied. See that all moisture is removed from the rod. Unwind all the line on your reel and let it dry out thoroughly before you start out again. Don't use a knife blade in trying to unsnarl a "backlash" on your casting reel. Backlashes (better known as "bird's nests"!) should be treated with a button hook or better yet a hairpin, neither of which has cutting edges. Don't let anybody step on your line when you're in a boat, on the shore or anywhere else. The plunk of a big outdoor boot on a fish-line is almost as bad as using a knife on it. A step doesn't break the line at the time but it is apt to part a little later when you have a whopping big fish on it. Don't leave your lines, rods or reels out over night. The soaking they will get from the dew is almost as injurious as that received in a rain. Another point is this, if the joints of your fishing rod fit rather tight don't twist the joints when you take them apart. Separate them by a straight pull and begin with the tip. Tight-fitting ferrules can be "eased up" by rubbing with a piece of emery paper. Don't take your rod apart and toss the pieces on the ground, as sand in the ferrules means trouble. When walking through the brush with your rod don't carry it tip first. Grasp it just above the butt so that the point trails behind you waist high. Many a steel rod has been ruined and many a wooden rod broken by ramming the tip into trees. Never stand a rod or any of your tackle (reel, hip boots, lures, lines, etc.) near a hot stove or a radiator. Keep these things away from heat, if you want them to last.

No matter how careful one is when on a fishing trip there may be an accident. Hence, the wise fisherman takes around a little emergency repair outfit so that he can make a quick repair in the field. One day last summer, just two hours before taking a train for home, we were on a small lake trying to get a mess of black bass to take back with us. A light rain had started to fall and the bass were hitting. With our time limited we were casting for all we were worth as fish were wanted badly and in a hurry. And then trouble stepped into the picture. We were using an inexpensive wooden rod. It cracked just above the ferrule, a decided fracture that would not permit us to even land a minnow unless repairs were made right away.

But our emergency kit was there for our rescue. Out came the tape, ordinary rubber tire tape. We wrapped the tip with this and in five minutes we were ready to take on any bass. With this repaired rod we hooked and landed eight good sized black bass and called it a day.

The fisherman can't foresee accidents but he can be ready for them with a pocket repair kit. On a long canoe and fishing trip which will take one far away from a base of supplies or tackle shop it is a wise idea to tuck in the duffel bag some or all of the following items: Lest the rubber boots fail take a small amount of rubber cement and rubber cloth; to repair a snag in your boot apply just a small amount of cement, put on the patch and then lay a stone, your tackle box or other heavy weight over it. This trick insures a repair job that will hold for a long time.

Practically every fisherman using wooden fishing rods carries along tire tape and ferrule cement. Both cost little, take up practically no space and are invaluable in repair jobs. We are still using an old bamboo rod that cost but six dollars four years ago although twice on trips to secluded lakes, reached by long hikes, we have broken the tip of this rod and had to make emergency repairs. Each time the break did not spoil our fishing, as the lateral splice which can be made with tire tape saved the day. The stunt is simple. When the tip breaks place the broken

ends side by side for 1½ or 2 in., and then bind them with tire tape. Such a repair will hold although it is temporary and you will have to eventually replace the tip. With the tire tape take along the ferrule cement. If your rod should develop a loose ferrule, heat it with a match, remove it from the wood, clean both the wood and the metal and then apply the melted cement. Take time out while it cools and you're then ready for more fishing.

In our little pocket repair kit we have the following articles which are "standing by" for trouble: A small flat file, a pair of wire-cutting forceps, a pair of baby pliers, a roll of tire tape for hastily repairing a long break, some rubber cement and cloth for repairing rubber boots or rubber pacs, a couple of feet of light copper wire so that in case one of the guides on a steel or bamboo rod is broken we can make a new one out of wire, and ferrule cement.

After an experience with a leaky canoe last summer we are considering the addition of a piece of ordinary laundry soap to this kit, as in a pinch it will do for repairing leaks. After traveling fifteen miles to a muskellunge lake with an Indian guide we secured a canoe and started out upon the lake for a wonderful day's sport. But the canoe leaked like a sieve. In the rickety old tumbledown boathouse where the canoe had been stored we found, after quite a search, a chunk of laundry soap. With it we filled the cracks in this manner: first moistening the places we rubbed the cake of soap over them until a thin layer was deposited. Through this the water could not flow and after ten or fifteen minutes of work with the laundry bar we went after the muskies. Moreover we kept our feet dry while doing it, as the holes in the canoe were plugged quite thoroughly by our repair work.

There are tricks in every trade and fishing is no exception. Checking up on your outfit before you start on a trip, packing along a simple little repair kit so as to be ready for accidents, and observance of a few common-sense rules in the care of tackle not only mean the saving of money for the angler but success when a big one grabs the lure and starts a fight, as faulty, neglected tackle can't cope with the big fighters of lake and stream that are now waiting for the disciples of Izaak Walton.

Coil Spring Protects Lawn Hose

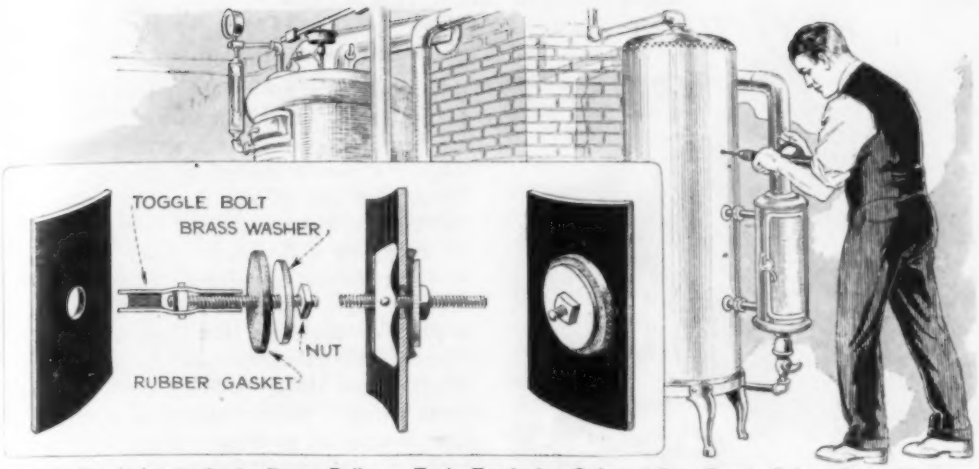
When the sill cock for the attachment of the lawn hose is in such position that the hose, when in use, must lie across the driveway, it occasions much annoyance. Either the hose must be moved each time a car passes in or out, or it must sooner or later become damaged by driving over it.

Heavy Coil Spring over Hose Protects It from Damage by Auto

To eliminate this difficulty, a Wisconsin home owner employs a stout coil spring, 10 ft. long, which slips over the rubber hose at the portion crossing the driveway. Wrappings of rubber tape at each end of the spring hold it in place. With the hose thus protected, a heavily laden auto or truck may pass over it repeatedly without causing the slightest damage.

Curing Elusive Knock in a Ford

A knock in a Ford car was heard only when the car was going upaill. After considerable investigation the cause was found to be a weak crank spring. This permitted the crank to fall back against the crankshaft, and every time the motor made a revolution there was a knock, which seemed to be in the engine. A new crank spring remedied the trouble.—Chas. Latour, Jr., Plattsburg, N. Y.



Simple Repair for the Leaky Range Boiler or Tank, Employing Only a 5-Cent Toggle Bolt, a Brass Washer and a Rubber Gasket

How to Fix That Leaky Tank

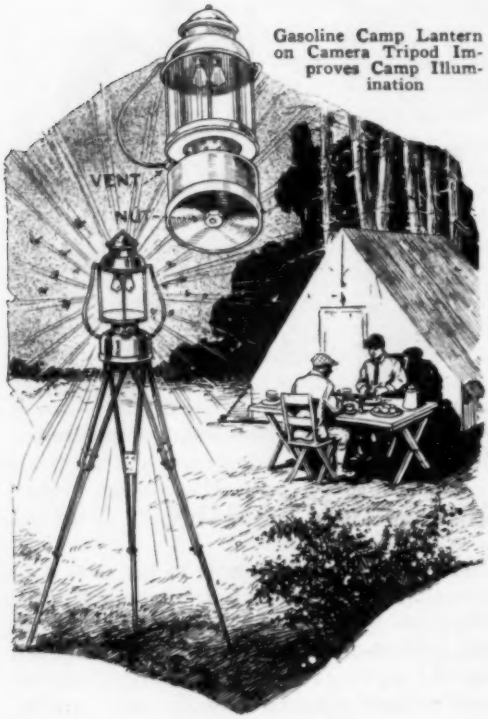
THERE are several ways of repairing a leak in a tank or range boiler. Sometimes a tapered steel punch is driven into the hole so as to turn the edges of the metal around the hole inward and thus form a surface that can be tapped for a common pipe plug. The plug should be coated with a mixture of litharge and glycerin before being screwed in. If the hole is in a tank of considerable thickness it can be quickly and easily repaired by using a special combination tap and plug that cuts and threads its way through the wall of the tank. A small leak in a seam may often be closed by merely rubbing a cold chisel along the edge of the seam or joint, but no attempt should be made to calk the seam unless the metal of the tank is of considerable thickness and the rivets are closely spaced and quite close to the seam edge, and even then extreme caution must be used.

One of the simplest repairs for a small hole in a range boiler, or any similar tank, for that matter, is shown in our illustration. Obtain, from the hardware store, or from the "five-and-ten," a 3/16 by 3-in. toggle bolt. This costs about a nickel. Also get a brass washer about 1½ to 2 in. in diameter, and with a hole a neat fit on the bolt. Cut a rubber washer or gasket a little larger in diameter than the brass washer from rubber about ⅛ in. thick; two pieces cut from an old inner tube will serve if no thicker rubber is available. Drill or file the small hole in the tank to a size that will pass the link of the bolt, pass the link through the hole, then put on the rubber and brass washers and tighten up the nut. It is advisable to curve the washer to the contour of the tank, and to file the metal beneath the gasket clean and smooth. A little candle wicking may be wrapped around the bolt shank to prevent leakage along the bolt.

Convenience in the Pantry

Our pantry is small and we have to make use of all the available shelving.

The boxes on the top shelf could not be taken down conveniently and a box or chair was necessary to stand on. By attaching handles to the boxes, as shown in the illustration, the difficulty was entirely overcome. The handles should, of course, extend far enough down to be reached from the floor.—M. A. Veatch, Billings, Mont.



Gasoline Camp Lantern on Camera Tripod Improves Camp Illumination

Illuminating the Camp

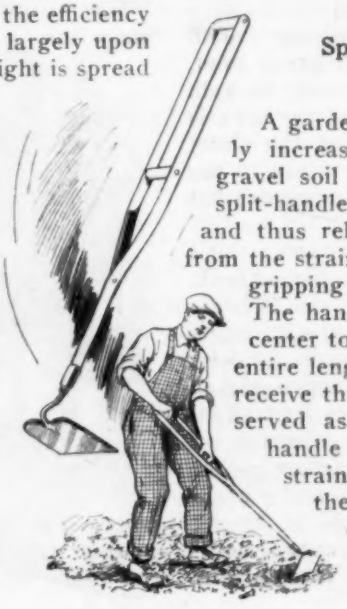
Nearly every well-equipped camper carries a gasoline camp lantern, and there is usually a tripod from a camera available. These articles can be combined to give better camp illumination. It has been learned from experience that the efficiency of the camp lantern depends largely upon getting it so placed that the light is spread evenly over the camp site. Finding such a place isn't always easy, but by putting the lantern on the tripod, an ideal installation is obtained. Merely sweat a brass nut that fits the screw in the head of the tripod to the bottom of the lantern. Light the lantern, screw it onto the tripod head and set the tripod wherever light is needed. The bottom of the camp lantern is slightly recessed so that the nut soldered to the bottom of it in no way interferes with setting the lantern down on a flat surface.

Getting Rid of Gophers and Moles

Gophers and moles damaging lawns and gardens can be driven away by dropping moth balls into their burrows and runways. I was troubled by gophers in my lawn, and all efforts to trap or poison them were unsuccessful. I experimented by dropping a dozen or more moth balls into the several openings. That was three months ago, and we have not had a gopher or mole on the place since. Obviously, the camphor balls have no worse effect upon these rodents than to drive them away. Nevertheless, it is an effective means of getting rid of such pests, especially where children may be endangered by the use of either traps or poison. —P. B. Robinson, Los Angeles, Calif.

Inner-Tube Repairs

In repairing auto inner tubes, a lot of time is lost in letting the air out of the tube after the leak has been found, and unless one is very careful, there is a chance of losing the location of the leak while the air is being let out. This trouble can be overcome by letting the air out of the tube through the puncture, which is easily done by enlarging the hole slightly with a sharp instrument, such as an ice pick, nail or the point of a knife blade. The enlarged hole is easy to see and can be patched as effectively as a smaller one.



Split-Handle Hoe Eases Hand and Arm

A gardener, whose labor was greatly increased by the hard clay and gravel soil of his garden, devised the split-handle hoe shown in the drawing, and thus relieved his hands and arms from the strain commonly experienced in gripping a smooth, round handle. The handle was sawed through the center to about three-quarters of its entire length and the halve spread to receive the short round pieces which served as hand grips. In use the handle does not put so great a strain on the small muscles of the hands and arms, but more on the shoulders and upper arms.—G. E. Hendrickson, Argyle, Wis.

A Chinese Teaser for Your Wits

THE puzzle shown in the accompanying illustration is an ancient Chinese trick, and, while a very simple one, once the secret is known, will keep the uninitiated working for hours, and get him tangled up in all kinds of knots and snarls before he discovers the method of solution, if he ever does.

The puzzle consists of a small wooden ladder of four steps. This may be made of any size and any wood. The only thing to be careful of is to get the steps far enough apart so that the fingers will go between them comfortably; about 1½ in. apart will do. Two 1/16-in. holes are drilled in each step and another in the top of one side piece, and through these holes is threaded a length of fine fishing line, about a yard long. Between each pair of steps and on top of the upper one the line is also threaded through little round "counters." These may be cut from a large dowel, made from old corks, or, in fact made in any way handy; the exact size and shape do not matter in the least. They are from 1/16 to 1/8 in. thick, and have a 1/16-in. hole drilled in the center for the cord also. Fig. 1 shows how the puzzle looks when finished and threaded. The end of the line is threaded through the hole in the top left-hand corner of the ladder and a bead is knotted on the end to keep it from pulling out again. On the free end of the line a fine-wire needle is knotted. The problem is to get the line out of the holes in the ladder, but to leave the counters threaded on the line, as in Fig. 4.

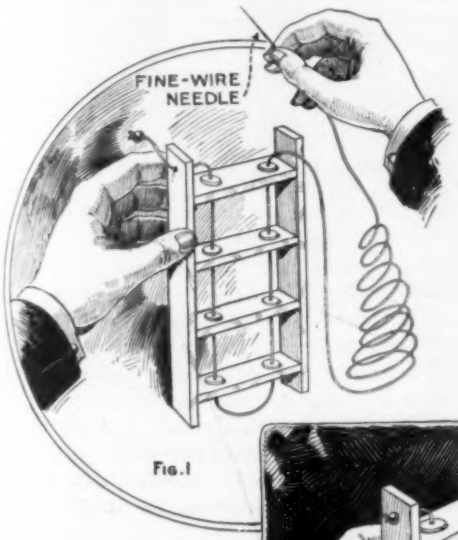


Fig. 1

A Puzzle from China, Which, Though Very Simple, Will Vastly Puzzle the Solver the First Time It Is Tried

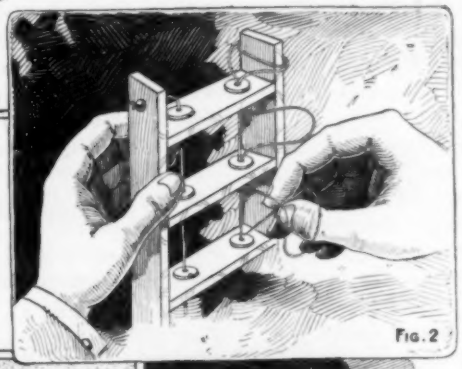


Fig. 2

Step No. 1 in the solution is shown in Fig. 2. Take a couple of turns of the line around the top right-hand end of the ladder, not too tight, but enough to hold the line. Then thread the line back again through all the counters and the holes in the ladder, down the right-hand side and up the left. As will be seen, this exactly reverses the original threading, and, if the turns were thrown off the upper end of the ladder the line could be drawn out of both ladder

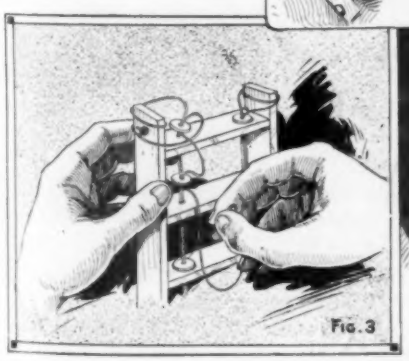


Fig. 3

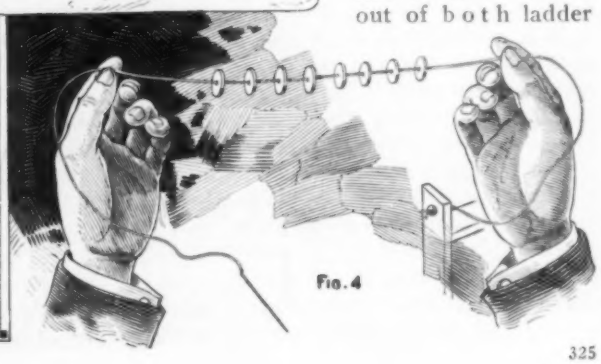
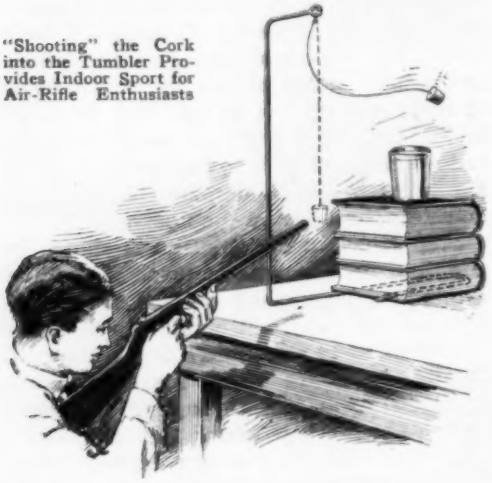


Fig. 4

and counters. This isn't what we want, however, so leave the turns on the upper right-hand side. After passing through the counter on the upper left-hand side of the ladder, take another two turns around the left side at the top, as shown in Fig. 3, and thread the line back again, this time, however, passing the line only through the counters, and not through the holes in the ladder. The turns on each side at the top of the ladder can now be thrown off, and the line can then be drawn out of the holes in the ladder, leaving the counters on the line, as shown in Fig. 4. During the two threadings in the solution of the puzzle the line may become crossed and may not pull clear of the ladder easily. This can be overcome, however, as will be seen the first time the solution is attempted.

Indoor Game for Air Rifle

In cold or rainy weather, when out-door games cannot be indulged in, the boy with an air rifle may while away the hours in an interesting game that will meet the approval of the most cautious parent.



"Shooting" the Cork into the Tumbler Provides Indoor Sport for Air-Rifle Enthusiasts

After first taking care to observe that the chamber of the gun is empty, a small bracket should be made from heavy-gauge wire, as shown. This is placed upon the edge of a convenient table and books piled upon the base portion to prevent it from tipping or moving while the game is in progress. From the upper arm of the rack, a small cork is suspended by means of a stout cord and a heavy cup or tumbler is placed upon the pile of books.

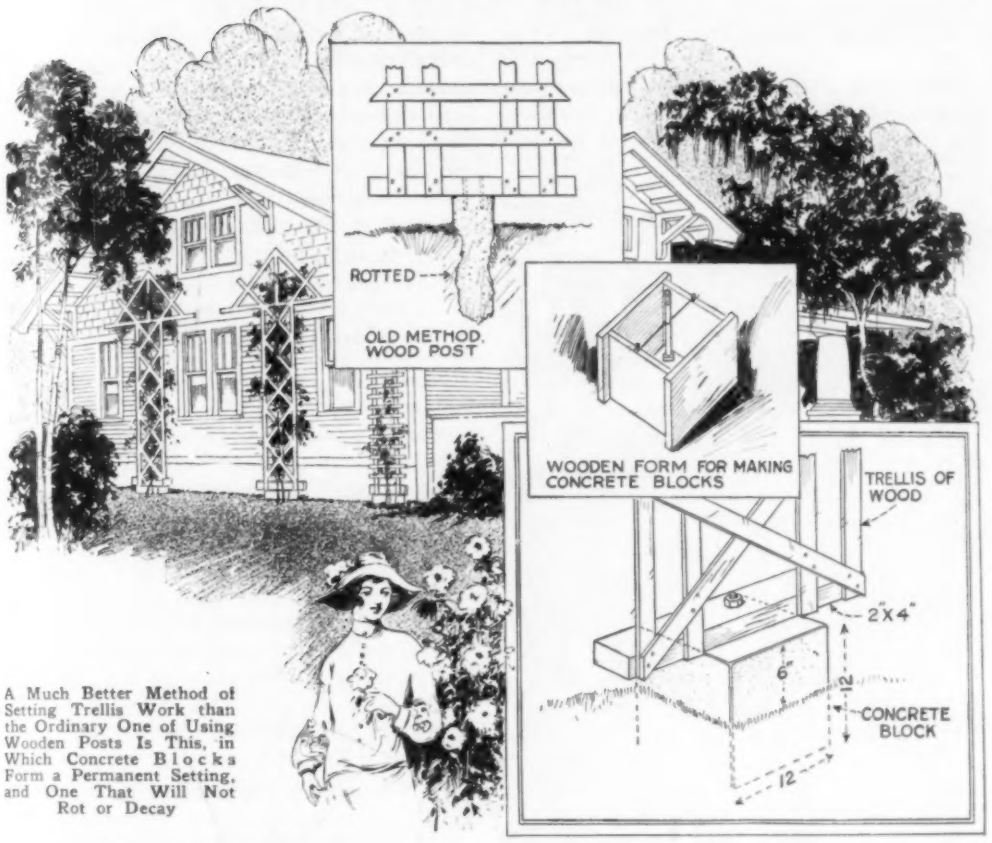
The barrel of the blank-loaded air rifle is placed near the cork and the gun fired in an endeavor to toss the cork into the tumbler. This is much more difficult than would at first appear, as the strength of the explosion, the angle of firing and the possible deflecting of the cork against the tumbler must all be considered. If several players take part in the game, each shooting in turn, it may be made highly interesting. The length of the string suspending the cork will depend upon the height of the rack and the height and position of the tumbler.

Gluing Linoleum to Iron Steps

To attach a strip of linoleum to an iron stair tread with glue seems nearly impossible. However, it can be done in the following way; Dissolve three parts of glue in eight parts of water and to it add one-half part of hydrochloric acid and three-quarters of a part of zinc vitriol. Let the whole boil for five or six hours. Apply this to both the stair tread and the back of the strip of linoleum with a brush. Place the linoleum in position and put a weight on it for at least twenty-four hours. The linoleum will stick to the iron and a cause of accidents on stairs will be avoided.

Garden Rocker Settee

With only a little work, one home owner turned out an attractive rocker settee for his garden. The legs of an old settee were removed and those taken from an old rocking-chair substituted, as shown in the photo. Before using, each joint was glued to make it as strong as possible. This settee was found to be the most popular piece of his garden furniture.



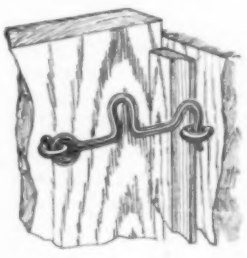
A Much Better Method of Setting Trellis Work than the Ordinary One of Using Wooden Posts Is This, in Which Concrete Blocks Form a Permanent Setting, and One That Will Not Rot or Decay

Setting Trellis Work

There is no question about the improvement that can be effected in the looks of the home by the employment of simple trellises, but the common method of setting these has one great defect. In this method the bottom of the trellis is nailed to a post sunk in the ground, and this rots in time. A much better way to set the trellises permanently is shown in the illustration. A simple wooden form is made that will hold 1 cu. ft. of concrete, as shown in the detail, and a bolt, about ½ by 14 in., is suspended by means of a twisted wire so that the head of the bolt is about 2 in. from the bottom of the form. The wire can be fastened to two nails partly driven into the upper edges of the box at the center. The form is then filled with concrete. After the concrete has cured, the block is removed from the form, and a short length of 2 by 4-in. stock drilled and fastened to the block by means of the bolt. The trellis is then nailed or screwed to the 2 by 4, using either galvanized roofing nails or brass screws.—Harry Lampert, Fillmore, Calif.

Adjustable Screen-Door Hook

When a screen door of the ordinary type is used, it may be necessary to change its position on account of swelling or sagging of the door. To overcome this, a hook made with an adjustable loop, as shown, may be used. The wire from which the hook is made should be stiff enough to hold the door securely but such that the loop may be opened with a screwdriver or closed with a pair of pliers to lengthen or shorten the latch as may be necessary.—G. E. Hendrickson, Argyle, Wis.



Mirror Helps Sign Painter

Gold-leaf lettering has to be put on from the inside and it is almost impossible for the workman to see just how his job

Mirror Hung on Outside Shows How Sign Is Progressing; Bracket Details

is progressing unless he endangers his life by leaning out of the window to take a look at it. After lettering a number of office windows in the usual way, the writer devised the method of watching this work as shown in the illustration. It was no trick at all to rig up a bracket for holding the mirror. The bracket is made rigid, to keep the mirror from swinging, and folds up conveniently when carrying it from job to job. The bracket is fastened to the sash and moved along as the job progresses.—P. B. Robinson, Los Angeles, Calif.

Painting Brick Foundations

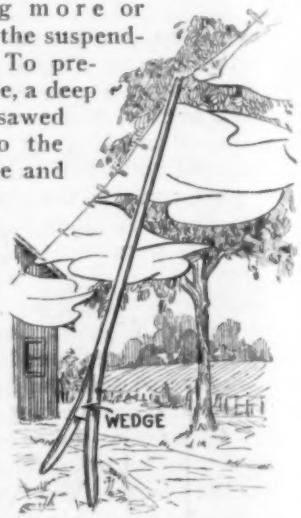
If paint is put over bricks in a home it may mean damp cellars as the temperature of a cellar is seldom the same as outdoors. In the summer it is cooler and in the winter, warmer. This difference in temperature, added to the fact that the larger part of the cellar wall is beneath the ground, makes for dampness within the basement. Except after a beating rainstorm the outside of the bricks will not be damp, because the constant circulation of air dries them. Inside the air is more stagnant. The dampness gathers on the bricks, and, as bricks are porous, soaks into them. If the bricks are unpainted, this dampness is drawn out of the bricks on the outside and evaporates, with a resulting dry cellar. If you paint the bricks, the lead in the paint fills these pores and prevents the dampness from getting out. —J. S. Hagans, Chicago, Ill.

Corn Cobs and Insulation

In erecting a new poultry house last fall, we were anxious to make it as warm as possible and decided to pack the walls with some insulating material. We had no sawdust, so someone suggested grinding up corn cobs in our feed grinder and using the cob meal for the purpose, and we turned out 40 bu. in about two hours. It was tamped between the walls and when doing so, we sprayed old crankcase oil on the meal to discourage insect life. The meal packs like sawdust and, as long as it is kept dry, is just as lasting.—G. G. McVicker, North Bend, Nebr.

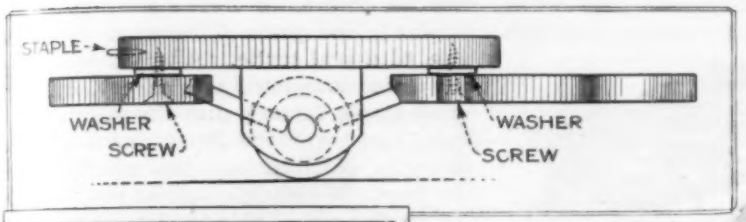
Non-Slip Clothesline Pole

Clothesline poles often slide along the line during a high wind and fall on the ground, causing more or less damage to the suspended garments. To prevent this trouble, a deep slot should be sawed lengthwise into the butt of the pole and the two halves spread apart by a wooden wedge which is nailed in the crotch. This provides two legs for the pole and, although a clothesline supported with such a pole can swing back and forth, there is no lateral sliding, and it cannot be dislodged easily.—G. E. Hendrickson, Argyle, Wis.

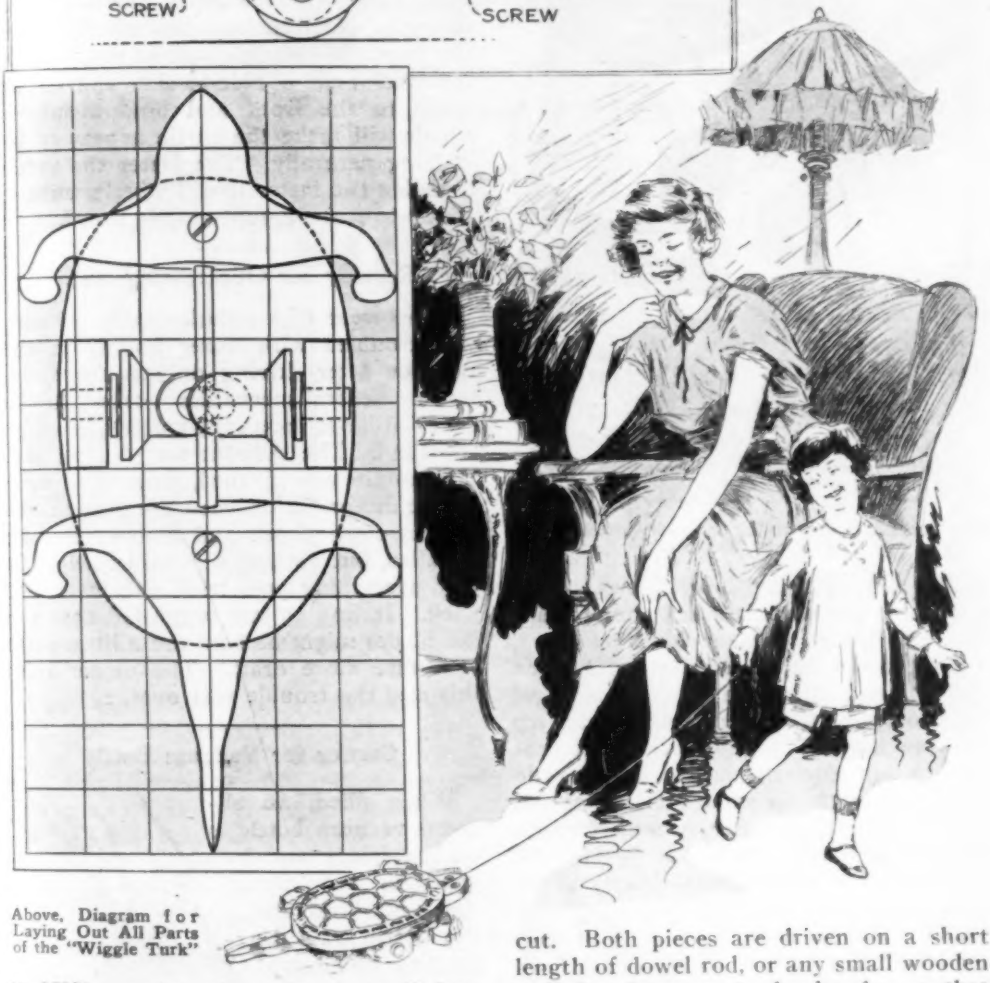


This "Wiggle Turk" Amuses Everyone

By LEONARD J. LEBOLT



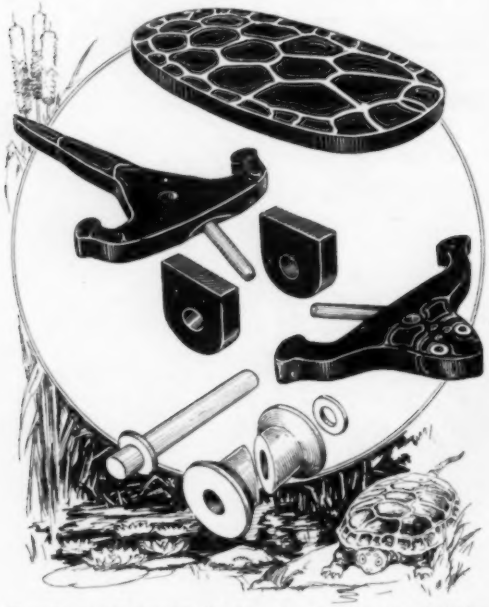
Toy Turtle, "Worked" by a Slotted Thread Spool, Moves Its Feet, Head and Tail, Which Makes It Appear Alive



Above, Diagram for Laying Out All Parts of the "Wiggle Turk"

LIKE a real turtle, as it moves all feet, tail and head while it is pulled over the floor, the toy wood "turk" shown in the illustration will be particularly appealing to children. It is made of ½-in. wood, which is obtainable almost anywhere, an empty thread spool of medium size and a few short lengths of ⅛ or 3/16-in. dowel rod. The head and front legs are one piece as well as the tail and hind legs. The activating mechanism is a thread spool, sawed in two pieces with a diagonal cut. Both pieces are driven on a short length of dowel rod, or any small wooden rod that happens to be handy, so that there will be a space of about ¼ in. between the parts of the spool. Washers are slipped on the shaft and it is then put in the bearings, which are made of ½-in. wood cut to the shape shown in the detail drawing. The bearings are nailed to the back with a few small finishing nails. Holes are drilled and countersunk through the center of the front and hind members as indicated and a hole is drilled diagonally in each member for a short piece

of dowel rod; which is cut long enough to project into the slot in the spool without binding. Then the front and hind members are screwed loosely to the underside



Details of the Turtle Showing Its Durable Construction and Simple Mechanism

of the body with flat-head screws, washers being provided between these members and body to reduce friction.

To get the same shape and design as that shown in the drawing cut a piece of paper 6 by 12 in. in dimensions and lay off lines to make 1-in. squares. Then proceed to reproduce the outline, drawing the curves through the same sections of the squares. It is, of course, necessary to do the cutting with a fret saw or jig saw. A fret saw can be purchased cheaply at almost any hardware store and will be found useful for many other purposes besides cutting out toys. After the parts are cut out, care being taken to have the grain of the wood run lengthwise through the narrow sections such as the tail, take a smooth half-round file and dress down the rough edges. Sandpaper is used to give the parts a smooth surface, and if desired to give the toy an exceptionally good finish, apply a coat of shellac.

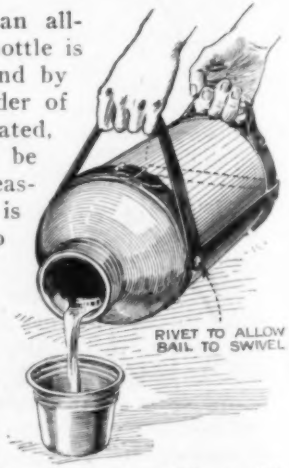
The painting of the turtle is a factor which adds considerably to its appearance. Quick-drying lacquers, which can be obtained in most paint or hardware stores, are very adaptable to paint toys of this kind. Keep in mind that bright contrasting colors are most appealing to the children, and proceed to paint the likeness of a real turtle. After the painting has been completed and is dry, drive a small staple or tack into the edge of the body just over the head and attach a string by which the toy can be pulled over the floor. When this is done the spool is revolved and a side-to-side movement given to the front and hind members, which will make the turtle appear to be walking naturally. The faster the turtle is pulled the faster it will wiggle, until it seems to make a super-turtle speed.

Remedy for Overheating Auto

The owner of a popular make of auto was troubled with water boiling in the radiator after driving only a short distance. Several mechanics worked on the car in order to locate the trouble, but they all failed. The radiator was flushed out, the muffler was cleaned, work was done on the motor, the valves were ground, the carbon cleaned out and a new fan belt installed, but nothing seemed to help. In fact everything was tried except an ice pack. It was at last suggested that the fan blades might be bent out a little more to create more draft. The owner tried this and the trouble was over.

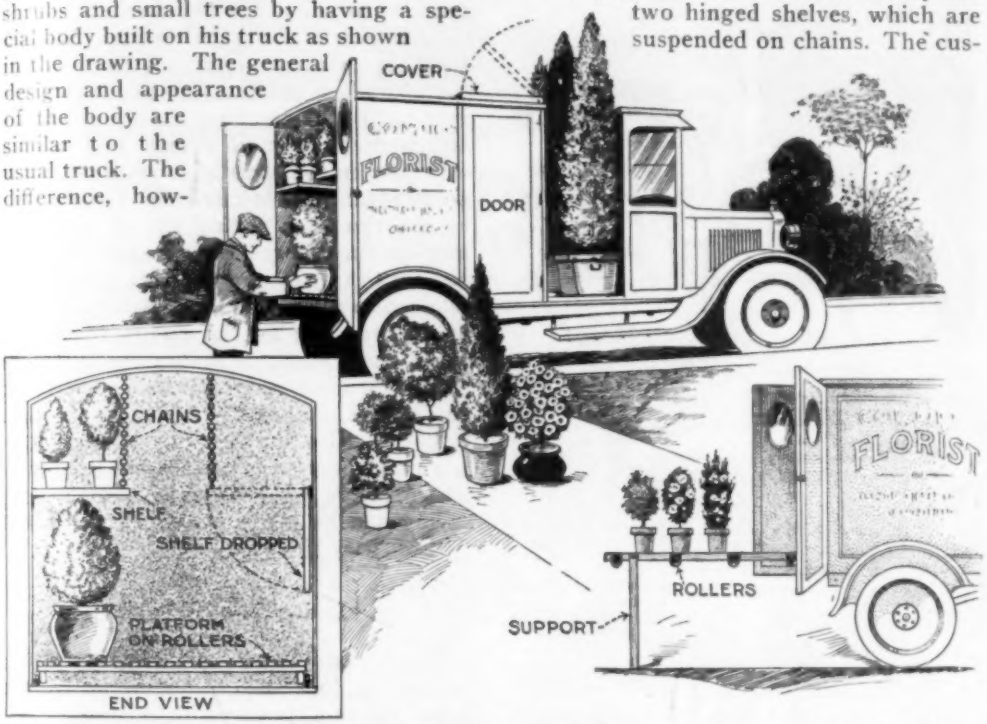
Carrier for Vacuum Bottle

When filled, an all-metal vacuum bottle is quite heavy and by providing a holder of the kind illustrated, the bottle can be handled much easier. The holder is made of strap leather, about ¼ in. wide and 3/32 in. thick, and is put together by riveting or sewing. Rivets are used to attach the bail so that it can pivot readily at this point.—R. D. Curtis, Dayton, Ohio.



Special Truck Body Aids Florist

A Long Island florist has solved the problem of carrying plants of all sizes, shrubs and small trees by having a special body built on his truck as shown in the drawing. The general design and appearance of the body are similar to the usual truck. The difference, however, is easily noted on closer examination. The forward part of the body, close behind the driver's seat, is cut out at the sides and the top to permit carrying tall shrubs and trees. Swinging doors are provided on the sides, hinged to open toward the back. These can be kept closed or open as the occasion requires. As the top of the opening is not braced or supported, the natural springiness of the frame causes the open space to vary at the top, and to prevent the doors from binding when this happens, they are simply allowed to rest against the side of the body and are fastened with a hook and eye instead of being set in frames. The hole on top is edged with a ridge front and back. This ridge helps to keep a hinged cover in place as shown. When no tall plants are to be carried, the doors and cover can be closed and the space used for other purposes. The remaining part of the body is also ingeniously arranged. A false bottom is fitted with rollers so that it can be slid partly out, providing easy access to the more or less fragile plants. Part way up on each side of the body are two hinged shelves, which are suspended on chains. The customary pair of doors are provided at the back.—Frank W. Hart, Bayside, N. Y.



Specially Built Body on Florist's Truck Accommodates All Kinds and Sizes of Plants and Shrubbery Conveniently and a Rolling False Bottom Facilitates Loading

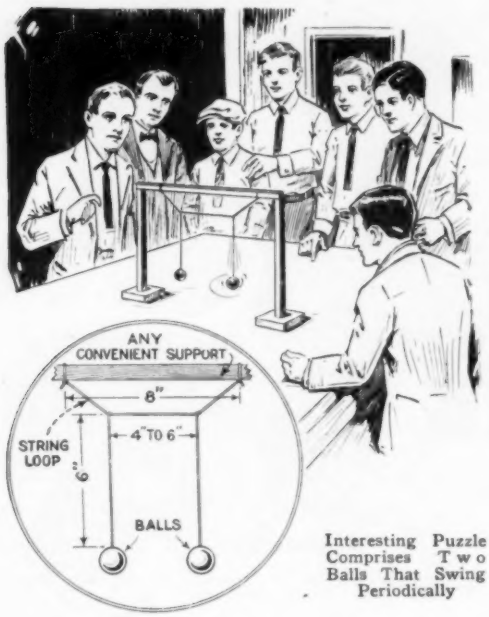
Floor Protectors

In trimming windows, waxing floors, etc., where the shoes are hard on the floor, protectors which slip over the shoes come in very handy. These can be made in a few minutes from an old inner tube. A Ford high-pressure tube is about the right width. Cut off a section as long as your foot and cut an oblong piece from the top side of this section to fit over the instep as shown in the drawing.

¶ You will have no trouble in keeping lice from your fowls during warm weather if you use plenty of disinfectant, spraying it on with a spray pump.

Amusing Puzzle in Physics

The device shown in the drawing is interesting for grownups as well as children. It consists of two equal weights of 1 oz.



Interesting Puzzle Comprises Two Balls That Swing Periodically

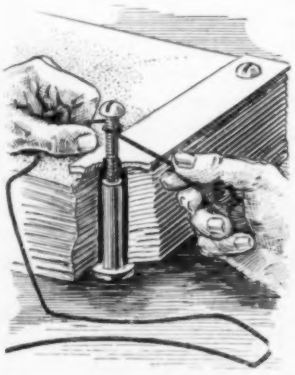
or slightly less, two standards on bases and a horizontal bar of wood, preferably 1-in. material, and some string. Lead or iron balls are good to use for weights but heavy fish-line sinkers or hexagon nuts will do just as well. The apparatus is set up as shown, the two weights being attached to lengths of cord 6 or 7 in. long. The length of both must be exactly equal. A slack string is tied to the crosspiece at points about 8 in. apart, and the strings holding the balls are tied to this string at points 4 to 6 in. apart. The strings should be tied so that they can be slipped along to vary the distance between them. In operation, one ball is held stationary and the second ball is allowed to swing. The first ball is then released. The swinging ball will gradually impart its energy to the other ball and will then lose its own energy so that the other ball starts swinging vigorously. Then as soon as the ball is hanging at rest it absorbs energy from the other ball and starts swinging again, while the other one comes to a stop. This periodical action will be repeated several times.—Robert F. Payne, New York City.

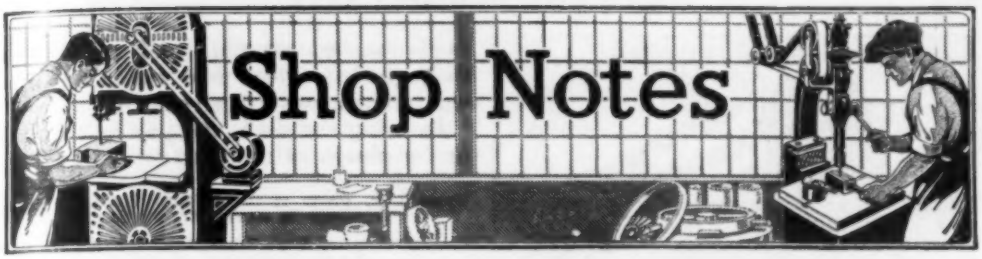
Doubling Life of Typewriter Ribbons

When a typewriter ribbon becomes worn to such an extent that a new one must be provided, do not throw away the old one if it is not worn through, but sew it to the new one in such a manner that the old one will be on the side hit by the type bar of the machine. If the old one is attached firmly and evenly and wound carefully on the spool the first time, it will go on nicely, and it can easily be seen that by the type bar hitting the old one and making the impression through the new one that the wear on the new one will be reduced to a minimum. Constant striking of the type bars on the ribbon sometimes wears them through before the ribbon is really worn out so far as ink is concerned, and by this method the life of the average ribbon can be doubled. In offices where large numbers of machines are used, and where heavy work is done, worth-while saving can be made in this way.—Henry A. Courtney, Atlanta, Ga.

Loose-Leaf Binders

I had made up about 1,000 booklets to be put in loose-leaf binders, using two brass binding posts with screws. The screws were machine-threaded and fitted in a loose manner. Putting these together by hand proved a tedious job, so I devised the method shown in the illustration. When all my binders were ready, I laid as many as I could on a flat table and set up the two posts in each. I then started the screws into each of them, but instead of putting them all the way in by hand, I took a short piece of ordinary cotton twine, wrapped it around the top of the screw once, and, using it as a snubber, pulled the short end of the string forward, holding the other end in my hand.—Kenneth E. Peterson, Oakland, Calif.





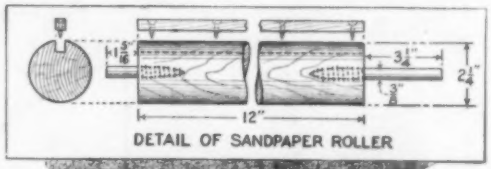
All Shop Notes published in 1925, in book form—Fifty Cents—from our Book Department

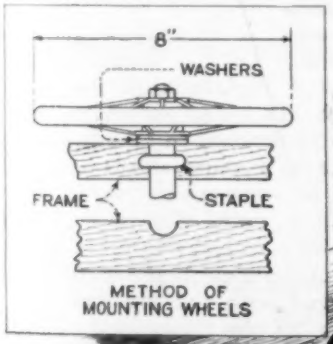
You Can Make This Floor Sander

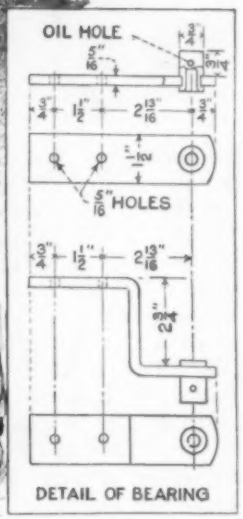
By EDWARD SHAW

MOST modern homes have either hardwood floors or parquet floors in some part of the house. If it becomes necessary at any time to refinish these, a big problem presents itself. To sand the floors by hand would involve a great deal of work and to make use of any of the acid cleaners is not entirely satisfactory. A small rotary sander, capable of doing a good job, can be easily and cheaply constructed by the man handy with tools. The material required, exclusive of the motor, should not cost more than three dollars. A hardware store, or the neighborhood repair shop, would find a machine of this type a source of considerable profit, either if rented out to home owners, or used by one of its own men to refinish floors in local residences.

The perspective drawing and photograph show the completed outfit. In the second drawing is given a general assembly of the outfit showing the driving

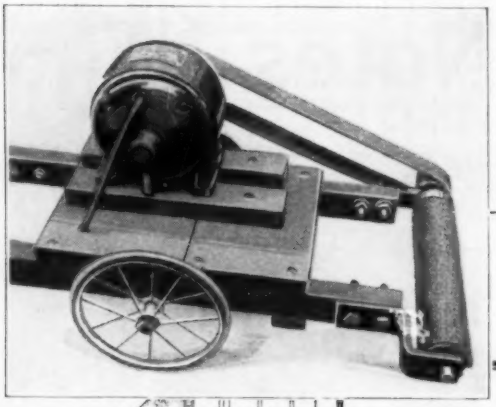


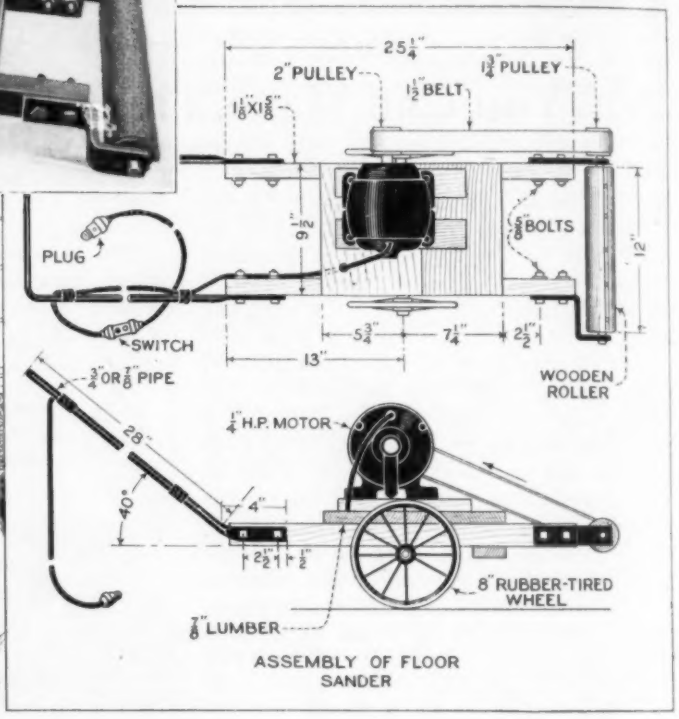




Various Details of Construction of the Floor Sander and Perspective Drawing of the Completed Machine in Use

motor mounted in place, power supply cord, etc. A ¼-h.p., 1,750-r.p.m. motor is used and it is advisable to use one of the





ASSEMBLY OF FLOOR SANDER

Upper Left, Photo of the Original Machine; Below, Drawings for Assembling the Sander

fit is pushed around. All wood used throughout is white pine and all the principal dimensions are given.

In using the outfit the power is turned on by means of the cord switch and the handle is lifted slightly until the roller begins to cut. In going across the floor it is well not to attempt to take too large a cut. Take a medium depth cut and travel slowly over the entire floor in some uniform fashion, going over it a second time if the floor is in bad shape. It is best to watch the Aloxite cloth and if it should become clogged with the old shellac or varnish taken off the floor, it should be replaced by a new piece.

After sanding the floor, several coats of varnish or shellac and wax can be applied.

inclosed type, or else it will be necessary to cover it up while in use in order to keep out the dust. The abrasive used is coarse No. 00 Aloxite cloth, which, at the speed of the roller, cuts well and does not easily clog. For the roller, a rolling pin was used into each end of which had been fastened lag screws, as indicated in the detail. The brackets which support the wooden rollers are provided with bronze bearings, in which the roller is free to turn. One of the brackets is offset to enable the machine to come in close to the wall when in operation. It is very important to use but a very little oil in these bearings so as not to take a chance on having it get into the floor.

These details are all shown in the drawings, as well as the means used for mounting the shaft that carries the two 8-in. rubber-tired wheels upon which the out-

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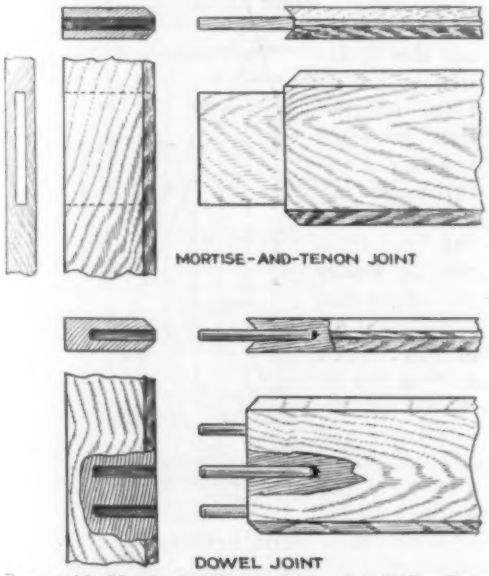
Making Phone Receiver Comfortable

The soft sponge-rubber caps used on radio headphones can be applied to advantage also to the ordinary desk-phone receiver. The cap is slipped over the receiver end, which it will grip even more

tightly than it will the average radio headphone. If provided with such a rubber ear cap, an ordinary phone is much more comfortable. In addition, disturbing noises and sounds are eliminated, because the cap fits the ear much better than the hard-rubber end. Phones used in the open air, for instance, on construction work, are very uncomfortable in cold weather, and the caps will help here, because the soft rubber does not feel so cold as the hard variety.

Door Construction

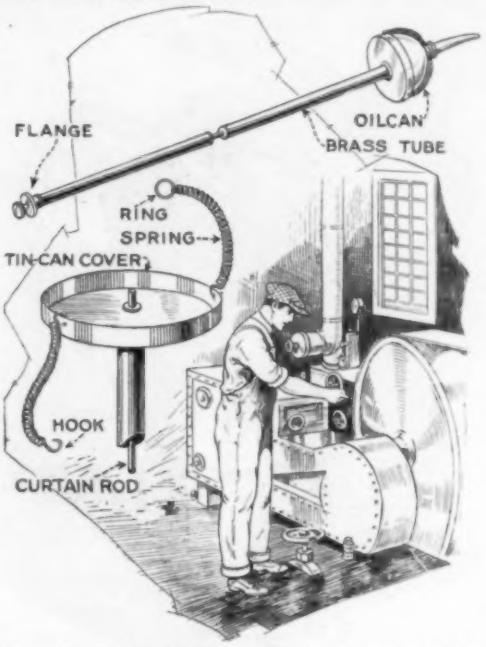
Mechanical tests of doors by the forest products laboratory have shown that, if put together by the through mortise-and-tenon method, the doors will have greater stiffness and resistance to sagging than either the dowel-joined doors or the type called "blind-mortised and tenoned." The last-mentioned, in which the tenons of the horizontal members, or rails, do not go clear through the vertical stiles, showed the lowest strength, but were somewhat superior to the doweled doors in stiffness. On being subjected to a damp atmosphere the blind-mortised and tenoned doors swelled the most, and in dry air showed the largest opening of joints. The doweled doors were the least affected by change of atmospheric conditions.



Doors with Mortise-and-Tenon Joints Are Stiffer But Swell More Than Those with Dowel Joints

Extension Oilcan Holder

To oil nearly inaccessible places in machinery the extension oilcan holder shown



Extension Holder for Oilcan Permits Oiling Otherwise Inaccessible Places

in the illustration will be found useful. It consists of a heavy tin-can cover into which the base of the oilcan fits. A hole, slightly larger than the diameter of a metal curtain rod, is drilled in the exact center and two small holes in the rim of the cover as shown. A suitable length of ½-in. brass tubing is soldered over the center hole, at right angles to the face of the cover and a small flange to the opposite end of the tube. Two stiff coil springs, fastened to the cover and slipped over the spout, hold the oilcan in position securely. A curtain rod is slipped inside of the tube and a washer soldered to the end to act as a push button. In use the can is guided with one hand while the button is pushed with the other.

¶When winding springs on the lathe, it is a good kink to turn the spindle backward a few times in order to relieve the strain of the spring. This eliminates the danger of injuring the hands as the spring will not fly back when the wire is cut off.

Portable Desk for Lumber Yard

Wholesale or retail lumber dealers who are compelled to carry a tally book about the yards when selling lumber from the

Shelf Wedged between Boards of Lumber Pile Serves as Writing Desk

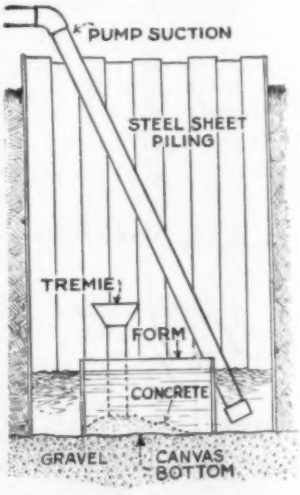
various piles, or when taking inventory of stock, are often inconvenienced by the inability to find a suitable book rest. A Wisconsin lumberman overcame this difficulty in the following way: A board upon which the tally book is fastened is provided with two flat-iron strips, which project about 6 or 8 in. beyond the end of the board. These are bent at a slight angle and, when inserted between the boards of a lumber pile, will hold the book at the height and slope desired for writing.

Welding Closed Containers

Metal tanks, barrels and drums are widely used to transport and store liquid products. When made by welding, such containers are permanently tight, but those made by other methods frequently develop leaks which the operator is called on to repair. Whatever work has to be done, the welder should never apply the welding or cutting torch to such containers until he is positive that they are thoroughly clean and properly vented. Make it a rule to clean every container regardless of what you think was in it. Thorough steaming of the container will effectively remove traces of volatile liquids, such as gasoline, and scrubbing it with a strong lye solution will remove all oily materials. Possibly the easiest and safest way to protect the operator is to flush the container thoroughly with water. Then turn it so that the damaged section is uppermost and fill up with water to the defect to be repaired. Welding is then done with the least possible space inside. This precaution applies not only to oxyacetylene welding, but to repairs by any other process as well. Even a blow from a hammer or friction, generating static electricity, may cause a spark that may ignite the gas in the tank. In welding or cutting on any type of closed container, the handhole or other fittings should always be opened before applying the flame.

Canvas-Bottom Concrete Form

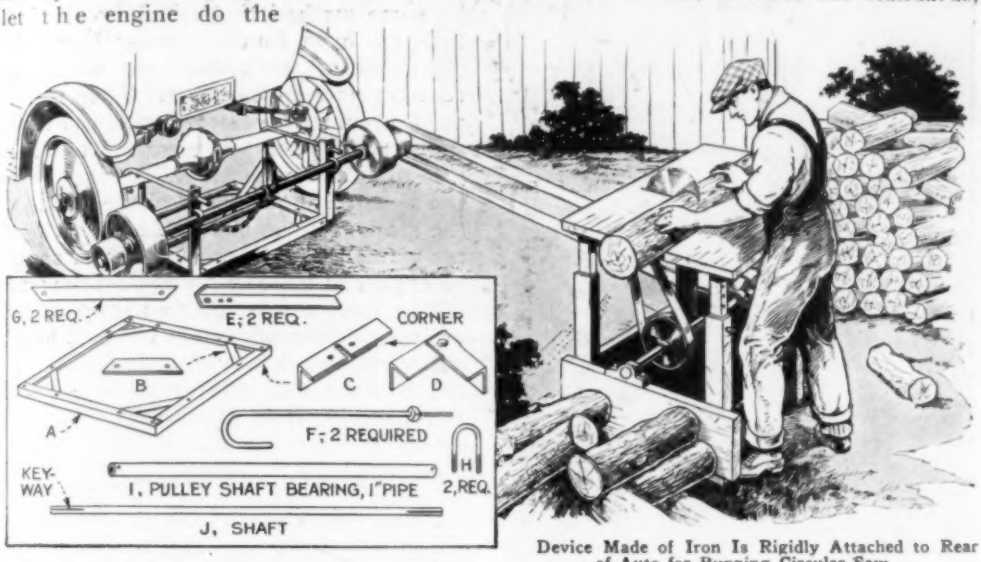
Undesirable eddies that wash the cement out of concrete poured under water, even though the mixture is carefully deposited through a tremie, can be prevented by using a form with a canvas bottom. The canvas, while allowing the concrete to settle into all the irregularities of the foundation, prevents water disturbances on the outside of the box from coming under the edges and through the bottom. Such a form can be used to advantage in pouring foundations for bridges, buildings, retaining walls, head gates, and other structures, where available pumping facilities cannot completely remove the water.



Farmer's Saw Driven by Auto

The farmer who has occasional need of a power-driven saw, grinder or similar apparatus, which requires from one to ten horsepower, can rig up his automobile to let the engine do the work. A simple device for transmitting the power to a saw is shown in the illustration. It consists of a shaft with two pulleys that come in frictional contact with the rear wheel, and another pulley to take the belt running the saw. The frame is about 3 ft. square and is made of 1½-in. angle iron. It is braced at each corner with a piece of strap iron, as shown at B. Four of these braces are necessary and they are 3/16 by 1¼ by 10 in. in dimensions.

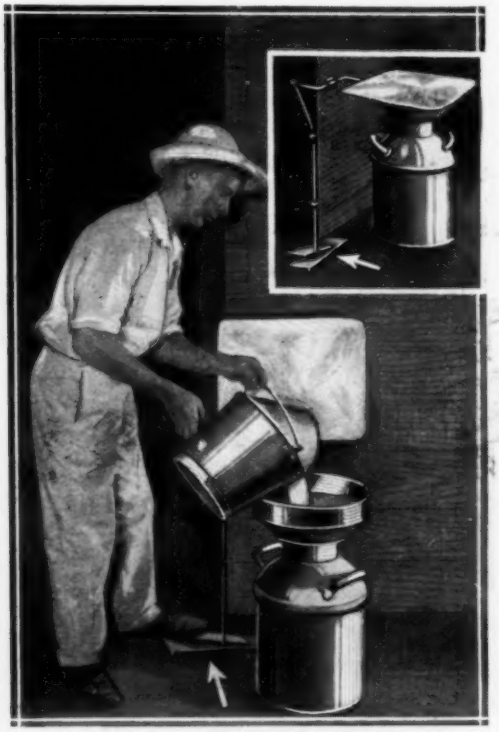
The main frame, A, is made by cutting a ¼-in. slot in one side of the angle iron, as shown at C, every 3 ft. of a 12-ft. length. The length is then bent at the slots to form a square, and overlapping parts at the corners drilled with a 5/16-in. hole for rivets, as shown at D. The standards, E, for the shaft bearings are also made of 1½-in. angle iron; each piece is 14 in. long. A piece of 1½-in. pipe, I, 4 ft. 4 in. long, is attached near the top of the two standards by means of two U-bolts, H. A 1-in. shaft is put through the pipe, centered, and, after wrapping oakum or other material about the shaft to fill the pipe at a position about 4 in. from each end, babbitt is poured into the pipe to form bearings at each end and at the center. Braces, G, which are 3/16 by 1¼ by 10-in. flat iron, are riveted to the frame and the body part of the jack to hold the latter rigid to the frame. Two hook bolts, F, threaded to a distance of 4 in., connect the standards,



Device Made of Iron Is Rigidly Attached to Rear of Auto for Running Circular Saw

E, to the axle of the car and hold the pulley wheels against the tires of the auto when the device is in operation. To use it, the car is backed to position over the frame, the latter being staked to the ground or attached to the floor. The car axle is lifted by means of the jacks until the wheels clear the surface. The two hook bolts are then set over the axle and the nuts turned on until sufficient pressure is given the two pulley wheels against the tires. A smaller pulley may be added to the end of the shaft for slower-speed machinery, and thus two or more machines can be driven at the same time. A chain connects the pipe supporting the shaft with the frame of the device, preventing the former from falling back beyond a determined distance. To move the device from place to place it may be inverted so that the wheels will roll on the ground and the frame then hitched to the rear of the car.—W. Mitchell, Rogers, Nebr.

¶A flat piece of aluminum, ⅛ in. thick by 1 in. wide, makes an excellent tool for cleaning files. A piece 5 in. long will be found most suitable.



Self-Closing Cover for Milk Strainer; Detail of Opening Lever in Insert

Two Kinks for the Dairyman

Anyone who has visited a dairy farm during the time when flies are numerous will appreciate the usefulness of the device shown in the photo, which prevents flies from getting into the milk strainer and thus makes for better sanitation. It is simply a cloth cover for the strainer, stretched over a wire frame. It is attached to a wall at such a height that it fits flatly on the strainer when let down, and is operated by a pedal and lever, as indicated in the photo. When a bucket of milk is poured into the strainer, the cover is lifted out of the way by pressing on the pedal, which, when released, allows the cover to drop down by its own weight. To keep an accurate record of the milk given by each cow, it is a good idea to weigh the milk on a spring scale and enter the amount on a chart. The weight of the pail is, of course, deducted.

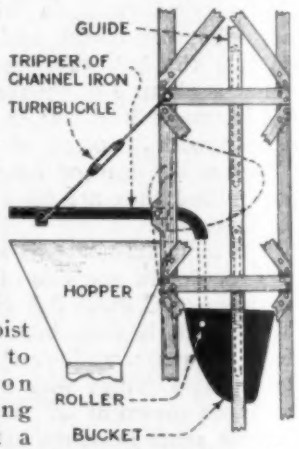
¶A straight bar magnet greatly facilitates the job of removing valve-spring retaining pins which are hard to grasp with pliers.

Adjustable Reamers as Mandrels

Sometimes the lathe man finds it necessary to turn the outside of a small piece true to a hole already sized and finished. This means that the piece must be held by some method that will keep the hole true. I have found nothing better for this kind of work than the adjustable reamers now so common. They are always accurately centered, and the shape of the movable cutters gives them just the grip to hold the work. With proper care, the reamer is not injured in the least, and the marks left on the inside of the work are hardly noticeable. The reamer should be expanded quite firmly against the walls of the hole in order that no slipping may occur, which would injure the hole by actually reaming it. A little judgment will tell how large a cut can be taken with safety.—S. J. Gee, Montpelier, Idaho.

Speeding Up Concreting

Faced with the problem of carrying on simultaneous concreting operations requiring two different mixes, one to be conveyed by motor dump trucks and the other to be spouted, I worked out an interesting hoisting-tower tripping device, which saves much time, labor and extra equipment. To put into effect a two-mix plan it was thought advisable to use the same hoist tower and to make provision for discharging the bucket at a lower level than that at which it discharged for spouting operations. So, I figured out the arrangement shown in the accompanying illustration. It consists of two guide arms of channel iron, slightly flared at the lower end, which are pivoted to the corner posts of the tower and held, when in operating position, by supporting rods, as shown. The supporting rods



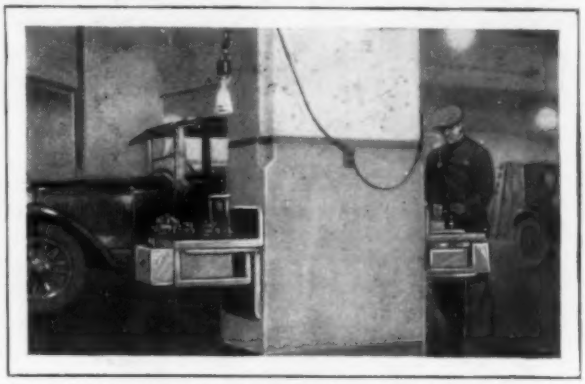
are provided with turnbuckles which permit quick adjustment to engage or to disengage the tripping device. When the bucket is to be discharged at the upper level these rods are disengaged and the tripper arms fall to a perpendicular position, allowing the bucket to pass by and up the tower. For discharging at the lower level the operator simply raises the tripping arms, pulls out the supporting rods, places the holding blocks at the lower ends of the rods in slots cut in the lower sides of the tripping arms to receive them, and twists the turnbuckles a few times to lock the arms. This operation is accomplished in a few seconds. On either side of the bucket is a small roller securely mounted on a pin. As the bucket is raised these rollers enter the flared ends of the trippers and follow along the channels, holding the lip of the bucket down while the bottom is being carried upward to the discharging position.—August Jeffers, Bedford, Ind.

Making Washers

When making several hundred small brass washers from ¼-in. round stock I found it rather troublesome to pick them out of the cuttings, which were collected in the small box I had placed to catch the washers as they were cut off. By fastening a piece of spring wire, about 10 in. long to the toolpost on the lathe, and inserting the other end in the hole drilled in the stock, the washers would slide down the wire as fast as they were cut off. This end of the wire was bent to form a hook to hold it in place, and the wire was placed in front of the tool post and slanted, to allow the washers to slide. The moving of the tool at each cut tends to stiffen the tension on the wire, holding it in place until the washers are all cut, when they are removed.—Chas. G. England, Washington, Pa.

Handy Workbenches for Garage

On each column in a San Francisco auto-service station, two handy benches for

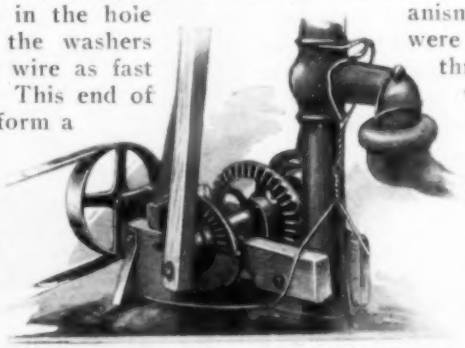


Small Workbenches Attached to Columns in Auto-Service Station Handy for Small Jobs

small jobs have been arranged as shown in the photo. The benches are provided with a vise and drawer for tools, and are narrower at the front than at the column side, so that there is no tendency for cars being driven down the aisles to catch the front edges.—Charles W. Geiger, San Francisco, Calif.

Binder Heads Make Pump Jack

The pump jack shown in the photo was made from two binder heads and a single cogwheel from the end of the trip arm, and gives a 6-in. stroke. It has been in use for a number of years and still gives excellent service. Two old bundle mechanisms from old binders were required to furnish the three wheels, two of which are alike, and the two shafts. The boxings were made of maple, soaked in oil, and oilcups are screwed down into the wood above the bearing to permit hard oil to be fed to the bearing. The pulley wheel was salvaged from a scrap heap. The pitman was a piece of hardwood, 1 in. thick, 2 in. wide, and long enough to reach the proper distance.



Efficient Pump Jack Made from Old Binder Parts Gives a 6-Inch Stroke

Easily Made Orchard Ladder Which Facilitates Picking and Can Be Moved About Readily

Convenient Orchard Ladder

Fruit pickers will find the ladder shown in the illustration of considerable utility and a great improvement over an ordinary ladder. It enables the picker to reach the top branches of the trees, can be moved about very easily and will not tip over. It is made from a ladder, two old mower wheels, or any other wheels of similar size, and some wooden braces and crosspieces. The upright braces are lengths of 1 by 4-in. stock, while the handlebars are made of 2 by 4-in. stock and fastened to the axle with iron yokes.

Asbestos for Annealing

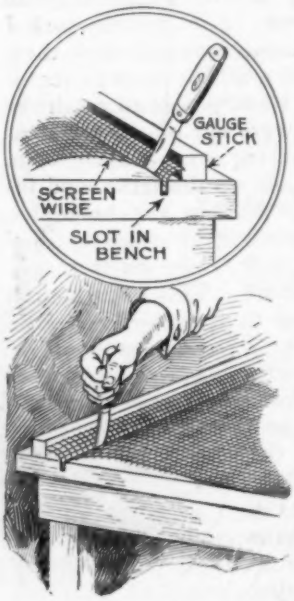
Asbestos is used in practically every foundry for covering hot castings. This paper is torn after being used once or twice, and it is then usually thrown away, which is an expensive practice. The torn paper can be used in the annealing bin by tearing it into small shreds, which make excellent material to bury castings in. The paper will soon become pulverized and will last a long time.

Method of Locating Partitions

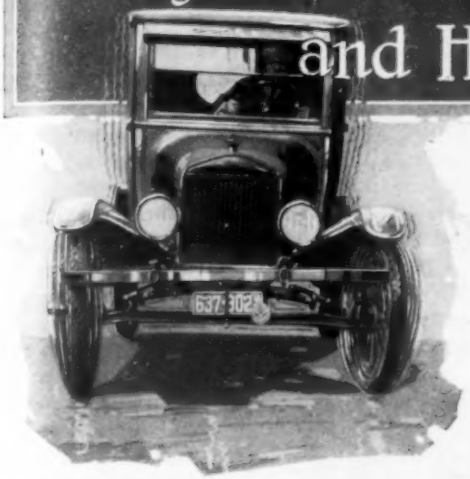
While doing a job of electrical wiring, difficulty was found in avoiding partitions and joists, which could be seen from an unfinished attic but were invisible in the furnished and plastered rooms below. A horseshoe magnet and a common compass overcame this difficulty. The magnet was placed close to the ceiling where it was desired to cut a hole, and the exact spot could be located on the other side by the dipping of the compass needle, which pointed to the pole of the magnet when the compass was moved in a circle around the approximate location of the magnet. This method is applicable to other difficulties of location where it is not feasible to measure, or drill test holes.—Floyd A. Meek, Rockbridge, Ill.

Turning Edges of Screen Wire

When cutting strips of screen for doors and windows the dealer is often requested to fold back the rough edges about ½ in. so that they will not unravel when tacked on the frames. Although special tools of the tin shop may be used for this purpose, the dealer in most cases has none of these and will find the illustrated method quite a timesaver. At the end of the screen counter, a straight stick, about ½ in. square, and of a length equal to the width of the counter, is nailed to act as a gauge, and ½ in. from this, toward the screen rack, a deep slot is sawed across the counter as indicated. To fold the end of a cut piece, it is placed against the stop gauge and a dull knife drawn across it over the slot in the counter.



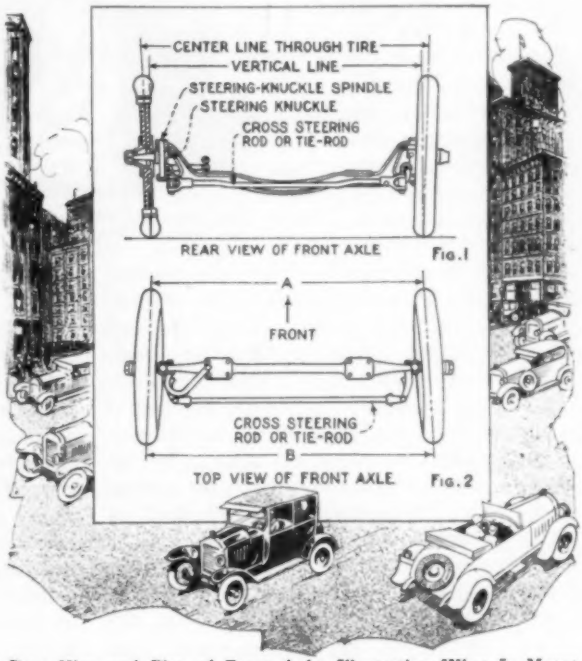
Why Your Car Shimmies and How to Cure It



THERE is nothing more annoying than shimmy in a car, whether it be the slight, sudden shimmy felt when the car wheels hit a rut in the road or the violent, uncontrollable vibration sometimes encountered in a balloon-tired automobile at high speed. In by far the greater number of cases the shimmy is easily cured, and still more easily prevented. Often the owner of the car can, with an hour or two of work, cure the trouble permanently, and any owner can prevent low-speed shimmy with a little time spent on the care and proper lubrication of steering connections. For the cure of the violent shimmy at high speed, cooperation with the manufacturer's service station may be necessary, but, even here, the owner can help a great deal by not allowing conditions to arise that will aggravate the trouble.

The front wheels of a car, if adjusted properly, do not point straight ahead, neither are they straight up and down Here is a sketch of the front axle and wheels, looking at them from the rear (Fig. 1). Notice that the wheels are closer at the bottom than at the top, due to the steering-knuckle spindle or king pin being set at an angle in the axle. This inclination of the wheels is usually about 2°. The idea is to make the center line of the king pin or spindle correspond, as nearly as possible, with the center line of the wheel at the point where the tire touches the road. This permits the car to be steered more easily. Another reason for it is that the wheels have a tendency to spread at the bottom and come together at the top when speeding, and the "camber" helps to compensate for this tendency.

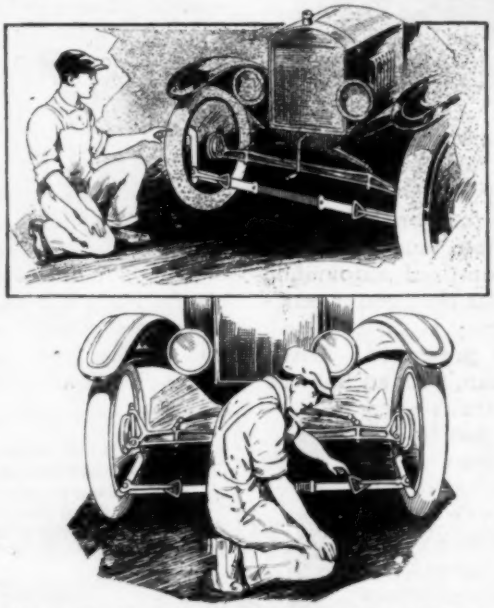
To offset the wearing action on the tires produced by the camber, and to make them wear more evenly, the wheels are "toed-in" at the front. Here is another sketch (Fig. 2). This is a top view of the front axle, and you will notice that the distance A is less than B. The difference between the two is the toe-in. In general it amounts to about ⅜ in., although on the Ford it is about ¼ in. The toe-in offsets a tendency of the wheels to "open up" at the front at high-speed, besides helping to equalize the wear on the tires.



Rear View and Plan of Front Axle, Illustrating What Is Meant by "Camber" and "Toe-In" on the Front Wheels of the Car

Too much toe-in, however, is as bad as too little so far as tire wear is concerned, for too much will cause the tread rubber to be ground off. Toe-in is sometimes called "gather," but the first term is the one generally used.

There is quite a little more to the design of the front wheels of a car than merely sticking them on the axle ends. And this is not all; there is the "caster effect." You have noticed how easily your bed or bureau rolls on its casters, and how quickly and smoothly it is "steered" in one direction or another. Well, the reason for this is all in the design of the caster; you know how the little wheel touches the floor at a point to the rear of the caster's vertical axis, which is the center line of the pin that goes up into the foot of the bedpost. Because of this, the wheel trails, and does not tend to change the direction of motion of the bed when pushed straight, yet the bed can be steered in any direction with scarcely an effort. The same principle has been used for years in the steering wheel of bicycles; look here (Fig. 3). A center line drawn through the steering column of the bicycle strikes the ground in front of a vertical line drawn through the axle of the wheel, so that the wheel, in effect, actually trails behind the steering axis, and, like the bed caster, the wheel tends to follow a straight line. This is why a cyclist can steer without using his hands. Exactly the same principle is used in the car. The front axle is "pitched" or tilted so as to throw the bottom of the steering-knuckle pin or king bolt forward, and thus cause its center line to strike the road ahead of the vertical axis of the wheel. Get your boy's bicycle and turn the front wheel to the right or left, then back straight again, noticing how the front end of the machine acts. Turning the wheel actually raises the front of the machine slightly; it is the same in the car, and the weight of the body tends to bring the wheels back to the straight-ahead position. The amount of caster varies all the way from 2 to 14°, depending on the type of car.



Above, Checking the Camber of the Wheels with Special Gauge; Below, Checking Toe-In

All this is necessary in understanding the cause and cure of shimmy. There are, in general, two distinct types of shimmy; low and high speed. Low-speed shimmy generally occurs between 15 and 30 miles an hour, and is noticeable whenever the car goes over rough pavements, uneven roads, or other surfaces that happen to have just the right characteristics to start the wheels shimmying. In these cases the motion is usually not very violent, and will, in nine cases out of ten, be found due to backlash or play somewhere in the steering-gear linkage. This, then, is the first place to look when your car starts shimmying at low speeds. Go over all the joints and knuckles in the linkage thoroughly, fitting new pins wherever necessary. It is a good idea to check the adjustment of the front-wheel bearings also at the same time, and remedy any play that is found in them. Another simple cause of an annoying shimmy is too much lubrication of the springs. The springs need a certain amount of friction between the leaves, and if this is destroyed by too much oil or grease, the body may tend to "hop" or vibrate with the disturbance of the front wheels, and this aggravates the shimmy.

Shimmy at high speeds is a much more serious problem, partly because it is usually more violent and partly because a permanent cure is by no means so easy. The

first remedy to apply is to watch the tire pressures closely. Balloon tires especially are sensitive to underinflation, but even high-pressure tires will cause a shimmy if they get very soft. So keep your tires at the pressure recommended by the maker of the car, even if it does involve checking two or three times a week, and see especially that the front-tire pressures are kept equal.

The next thing is to check the toe-in of the front wheels. Set the right front wheel straight ahead, then tie one end of a long, stout string to a spoke on the front of the wheel, pass it around the back of the forward part of the tire, then around the front and lead it back to the rear wheel, keeping it as near the center of the wheel as possible. Pass it across the back of the car, around the rear side of the left rear wheel, then forward to the left front wheel and make it fast temporarily. Go back to the right side and see that the right front wheel is pointed straight ahead. This will be seen if the string touches both sides of the tires on the right wheels equally. Now take the free end of the string, keeping it taut, and hold it so that it touches the rear side of the front tire, at the center. Measure the distance from the string to the front side of the tire, and this will give the toe-in. This may be adjusted by means of the cross steering rod or tie-rod, and the maker's specifications should be followed closely. There are special gauges made for checking the toe-in and camber, but the string method is a good one for you, provided care is taken.

If the axle is not properly pitched it can be remedied by using an iron wedge between the front spring and spring seat

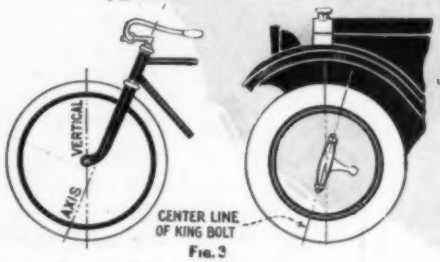


Fig. 3

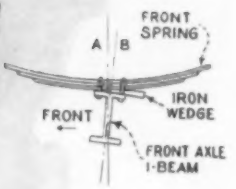


Fig. 4

Above, Gauge That Automatically Registers "Pitch" of Axle; Below, Diagrams Explaining Caster Effect

(Fig. 4). Since the amount of caster has been determined by experiment by the manufacturer and varies in almost every car, you will have to find out what yours should be before you can check it. A clever gauge is now being made that is attached to the front-wheel spindle and which, when the wheel is swung to the left and then to the right, automatically registers on a dial the amount of pitch on the front axle.

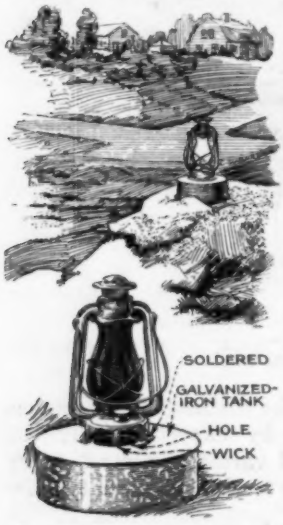
Balloon tires have caused much head-scratching on the shimmy problem. Many manufacturers have found it advisable to reduce the amount of toe-in to about ⅛ in. and this puts the owner under the necessity of keeping very careful check, to see that play in the steering mechanism does not alter it. Another maker has found that reducing the amount of caster, and consequently causing the car to steer harder, tends to dampen out the wheel

wobble, and still another has found that, while wheels themselves are usually balanced, vulcanizing on tires or putting in heavy repair boots causes unbalance and induces shimmy.

The things to do, then, in a case of high-speed shimmy are: Keep the tires inflated to the proper pressure; keep the wheels in balance; keep the steering linkage free from play; check the toe-in of the front wheels and the pitch of the axle; keep the front-wheel bearings adjusted, and don't allow too much play in king bolts or bushings before replacing them.

Large Oil Tanks on Lanterns

One construction company, which has considerable road work to do, saved much labor by providing the red lanterns with oil tanks of 1-gal. capacity so that they required attention only about once a week instead of daily. The tanks were made of galvanized iron, with a hole in the top slightly smaller than the bottom of the original reservoir, and the lanterns were soldered over this hole after the bottom of the small tanks had been cut away. After putting in an extra-long wick, the lanterns were ready for use.



Enameling over Putty

Every one who has tried to put on white enamel over newly puttied holes has noticed how persistently the putty shows through the flat white coats. If, instead of regular putty, a thick paste made of white lead and ordinary flour is used, the filled holes will cover as readily as the wood. A child's box sled, finished in this way, has stood hard usage and all kinds of weather for over two years.

Cleans Typewriter Quickly

Typewriter operators find it a difficult matter to clean their machines, because the dust and dirt from erasures enter every crack and corner and often remain there until the machine is taken apart. However, there is a simple solution to this problem, if a bicycle pump is used in connection with the other cleaning tools. It is quite an easy matter to blow the dirt out with the pump. A stiff brush is commonly used to clean the type, but it will be found that, if the bristles are covered with a soft cloth, the work will be greatly simplified. The bristles merely stir up the oily dirt without removing it, but the cloth, backed by the stiff bristles, will make the type look like new. When the platen roll begins to look shabby and rough, it can be renewed by smoothing it with very fine sandpaper. Most typewriter rolls can be removed quickly and easily and it is then a simple matter to do this.

Rubber Stamp Attached to Thimble

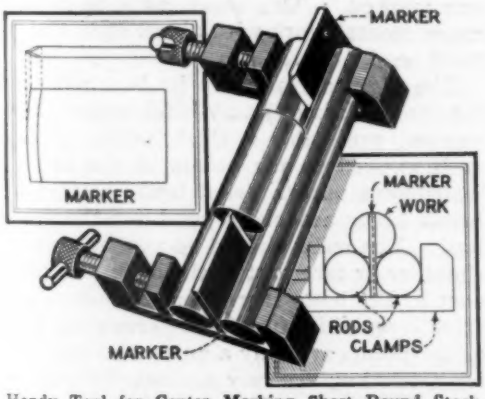
In canning factories, cold-storage plants and other places, where numerical or other identification and grading stamps are used, the thimble stamp shown in the drawing will be found very useful. The small round rubber stamps are removed from the original wooden handles and are mounted on thimbles, the ends of which have been flattened for this purpose. The stamps are fastened with glue or rubber cement. The operator then provides himself with a pad, strapped to the hand as shown, for inking the stamps. This is made from a cross section of an old inner tube with the ink pad glued to it. With a little practice he can ink and stamp much more rapidly than in the usual manner, and both hands are practically free to move or turn boxes and crates.—G. E. Hendrickson, Argyle, Wis.

Remedy for Run-Down Pump

A pump that persists in "running down" can be remedied in a short time in the following way: Remove the leather check valve and cut a piece of rubber from an old inner tube, or piece of rubber-patching stock, the same size and shape as the worn-out flap; attach this on the underside of the flap with the screw already in the latter. Put the pump together again, and you will have no more trouble of this kind. The rubber is more flexible than the leather and will not allow sand to collect on it.—Clyde Brindel, Yorktown, Ind.

Markers for Centering Short Work

A method of marking off the centers of short round pieces which is quicker than any of the various tools generally used for this purpose, is shown in the drawing. The complete set-up comprises two lengths of straight, round rod, two thin tool-steel cutters or markers, and a couple of clamps of suitable design. Both markers are ground to a central sharp edge on one side, this edge being also slightly convex. In assembling, the markers are placed between the rods at each end and all are held together by the



Handy Tool for Center Marking Short Round Stock Quickly and Conveniently

clamps. The piece of short stock is placed between the rods and driven sharply first against one and then against the other marker. After giving the piece a quarter turn the operation is repeated. Thus a cross mark is produced in each end and in practically the same time required to mark one end with the ordinary method.

Outside Chute in Haymow for Feeding Stock in the Yard

Outside Hay Chute

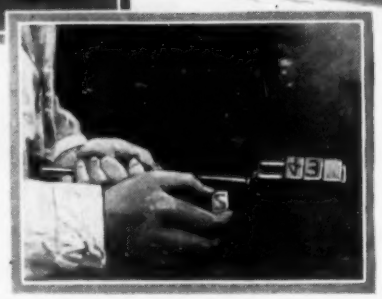
For feeding cattle in the yard, the outside chute illustrated herewith, which was built by an Oklahoma farmer, will be found convenient. The barn had a haymow of average size. At one end, the yard came up to the barn and the owner wished to feed the outside stock direct from the haymow. To do this it was necessary to build a chute with a floor at a 30° angle. The chute is 10 ft. from the ground and consequently the hay falls well away from the barn.

To Strengthen a Magnet

A permanent U-magnet may be strengthened in the following way: Place a keeper of iron or steel on the side of the magnet, from pole to pole and as near its ends as possible. Lay the magnet, keeper side down, on the bench, with the ends projecting over the edge. Hold the magnet firmly in place and, with a hammer or like object, strike the keeper sharply to the floor. Turn the magnet over and repeat the process. Do this several times. —Dexter W. Allis, Everett, Mass.

Tattooing Hogs Is New Marking Method

AS the ballyhoo man at the circus might say, "Step right this way, ladies and gentlemen, and see the new curiosity, the tattooed hog—just discovered by science." And while the subject of tattooing hogs may be new now, it probably will be so familiar within a few years as to be accepted as a matter of common procedure.



Upper Left, Tattooing the Hog; Below, How Blocks essary; Can Be Changed in Holder Upper Right, the Materials Nec-

Tattooing hogs, as conducted experimentally by scientists of the federal bureau of animal industry during the last five years, is a promising means of tracing tuberculosis, hog cholera and other ailments of swine to lurking sources of infection. Instead of fighting these microscopic foes in the dark, as one might say, the tattoo method of marking hogs enables one to determine just where the diseases have their strongholds.

The new method, in keeping with modern times, speeds up the process. The work must be done quickly to be practical, so the method provides for applying a full set of tattoo marks at one stroke of the marker and takes only a second. The instrument used in tattooing is a metal holder slotted to receive babbitt-metal blocks in which, when molten, phonograph needles are imbedded. The needles may be arranged to form figures, letters or other symbols. The blocks can be used in any desired combination, so it is possible to obtain a great variety of characters. The illustrations show the appearance of the device and the method of using it. The application of the marks causes no material pain or discomfort. "While the hogs sometimes grunt or hump their backs," Dr. Murray, the inventor, states, "very few squeal, and that is generally from excitement. An animal near a hog that is tattooed is just as likely to squeal as the one marked." This comment is based on experimental work with about eight thousand head.

The pigment found to be best adapted for the work is ordinary black automobile enamel, preferably a thick, sticky grade. It is applied to the points of the tattoo instrument with a small brush, a stencil brush being especially good for the purpose. The mark should be applied on the shoulder or fore part of the back. In that part of the body there is nearly always a thick layer of fat free from nerve ends and as the points are only a quarter of an inch long, the hog scarcely notices the operation. When a hog is tattooed in the manner described, the numbers or symbols used are plainly visible on the dressed carcass, even months afterward. Extensive inquiry among various branches of the live stock trade has failed to show any objections to the tattoo marks on carcasses. It is advisable, however, not to tattoo hogs on the hams. In developing the method, the investigators found that hogs could be

successfully tattooed also without any pigment provided the animals were slaughtered within the next 36 hours.

This phase of the work has a very practical application when hogs are shipped for immediate slaughter. The marks in that case are pink, due to slight capillary hemorrhages, instead of black which is the obvious result when the black pigment is used in the manner formerly described. Of course, the ability to tattoo hogs without any pigment greatly hastens and simplifies the work. But, as already implied, the mark in that case lasts only a short time unless the hog is slaughtered. Persons familiar with packing-house procedure know that hog carcasses receive very rigorous treatment, including immersion in the scalding vat and later under the beaters and scrapers which remove the hair. That is why a good tattoo mark, being below the surface of the skin proves satisfactory, while tags, paint marks, chalk and similar marking devices are undependable under packing-house conditions.

The principal use for the device appears to be systematic disease-control work, as conducted by state organizations and the U. S. department of agriculture. In this connection the tattoo method is sponsored by the federal bureau of animal industry, which about 15 years ago gave the swine industry the preventive serum treatment for hog cholera and more lately has been responsible for administering the nation-wide campaign to eradicate tuberculosis. The bureau also conducts federal meat inspection and has charge of suppressing such plagues as foot-and-mouth disease. With such an organization actively interested, stock owners are assured that the use of the tattoo device will mean prompt and systematic action in getting the greatest benefits from it. The device can be made and used by anyone.

¶In a loose-pin hinge, the pin often will work up and out. Removing it and driving it in from the bottom, will save trouble.

White-Painted Posts on Driveway in a Western City Insure Safety for Pedestrians

Depth Gauge for Sawing

There are many instances when the woodworker has to have a depth gauge and a miter box is too small. An easily made depth gauge is shown in the accompanying illustration. It consists of two wooden strips, about 2 in. longer than the saw and drilled at both ends for screws and thumbnuts. The strips are attached to the saw as shown, so that it will cut to the desired depth, then tightened again.

Useful and Easily Made Depth Gauge for Work Too Large for a Miter Box

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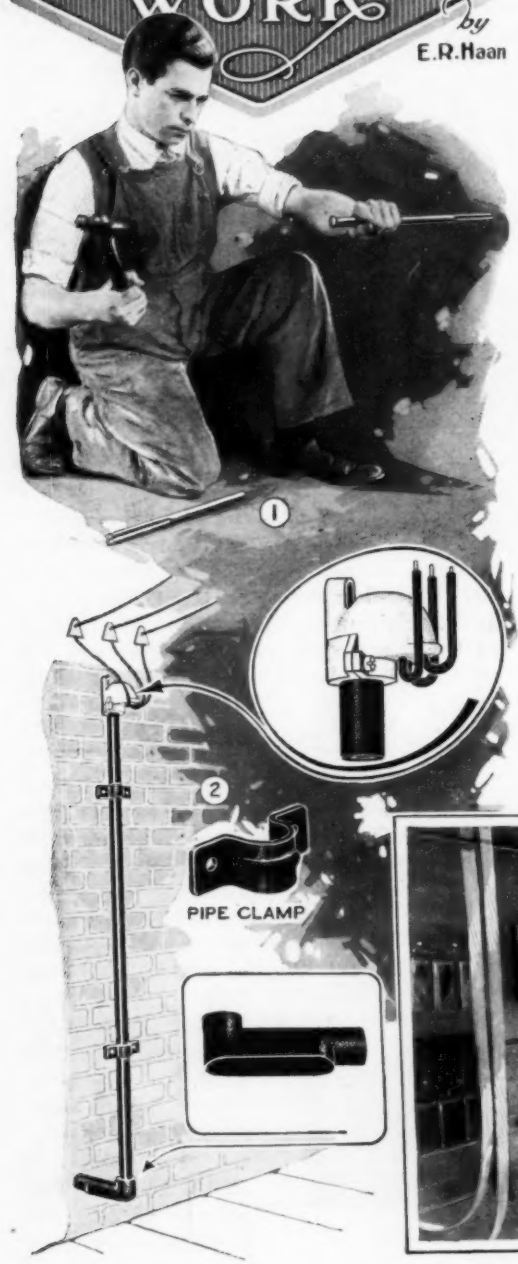
Converting Driveways into Walks

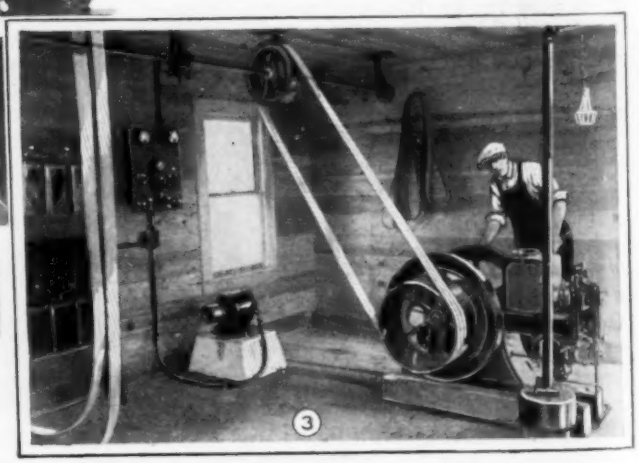
The accompanying photo shows how a western city changes its driveways into walks when the pedestrian traffic becomes more important than the vehicular. Iron posts, about 3 in. in diameter and painted white, were set across the roadway at intervals of 3 ft. The white paint makes them stand out against the dark road, at night as well as in the daytime, thus showing that the way is blocked, while the spacing permits the pedestrian to pass through easily.

DOING YOUR OWN CONDUIT WORK

by E.R.Haan



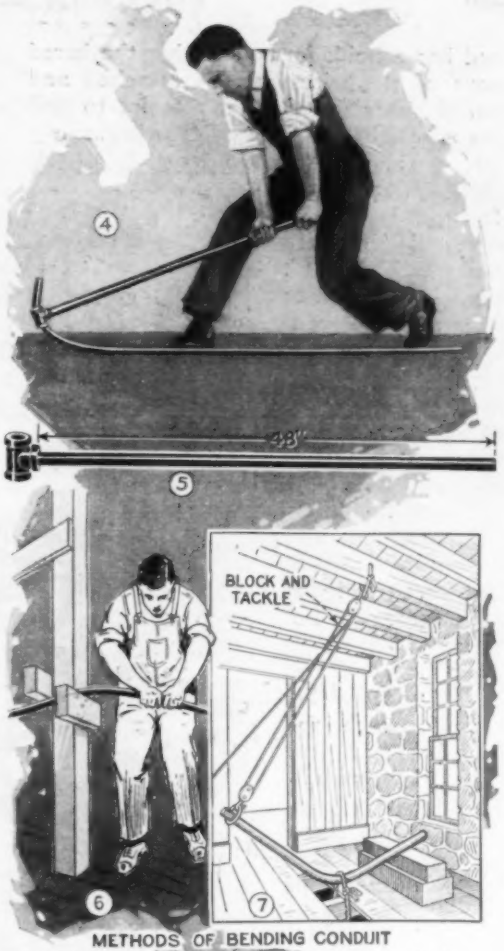
WHERE wiring has to be done in damp places such as basements or outdoors along the sides of buildings it is advisable to use rigid metal conduit, which protects the wires from mechanical injury and reduces the possibility of short circuits or grounds. This method of installation is especially recommended for service lines so that they can be run along the outside of the building as shown in Fig. 2. We have previously shown other methods of service-line installation where conduit is not available, but the conduit method is far superior and should be followed if possible. The fittings used are shown in the details. Ordinary pipe clamps are used to hold the conduit securely to the wall. In case of brick or concrete walls these clamps are screwed into wooden plugs driven into small holes made in the concrete. A pipe cap of the type shown, or any other kind which will not permit water to get into the pipe, is fitted at the top. At the bottom the conduit can be bent to a right angle or an L-fitting can be used as shown. Any electrical store and many hardware stores in the smaller towns handle conduit of the ½ and ¾-in. sizes which are most commonly used. Conduit is either lined or unlined. Lined conduit has a paper tube inside, treated with an asphaltic or similar compound and unlined conduit does not have this. Single-braided conductors can be installed in the former but double-braided conductors must be used for the latter. Where conduit is to be brought through a brick or concrete



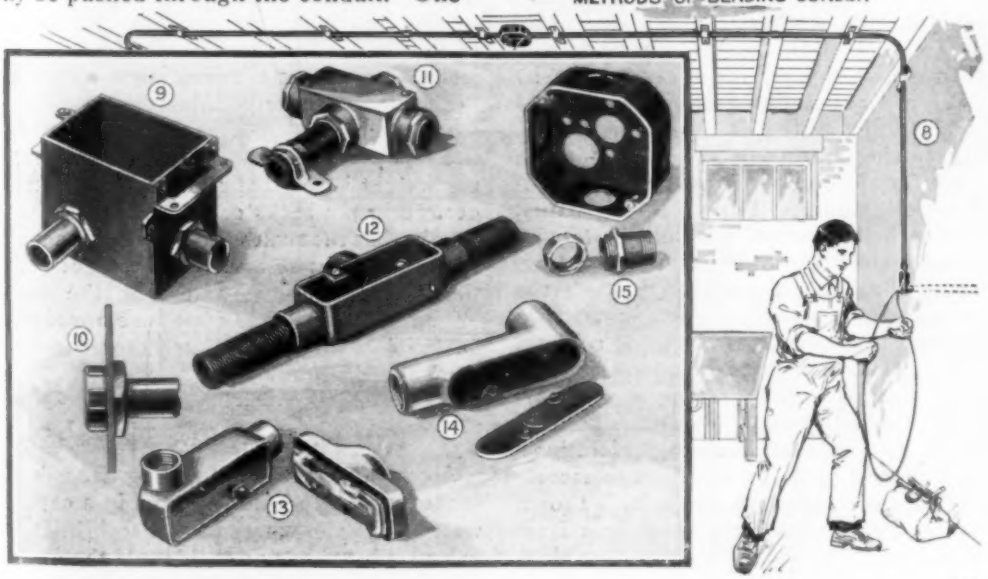
wall a star drill, obtainable at any tool store, should be used to make a hole as shown in Fig. 1. The length of conduit is measured, cut off, threaded and bent if necessary.

Bending is accomplished in different ways, Fig. 4 showing how a "hickey" is used for this purpose. This tool merely consists of a 4-ft. length of 1-in. pipe with a tee screwed on one end. It is advisable to make one before starting the work of installing the conduit as it will be necessary to use it constantly. This tool is used by placing the conduit on the floor and slipping the tee over the end. The worker then places one foot on the conduit close to the tee and pushes down on the handle. Care should be taken to move the tee to different points while bending to prevent the conduit from buckling. Other methods of bending conduit are shown in Figs. 6 and 7, the latter being especially adapted to bending heavy conduit, as a considerable leverage is obtained with this arrangement. When bending conduit one should always take care not to make the bends too sharp or the conduit may buckle, which will make it useless, as the wires cannot be run through it.

After the conduit has been completely installed, the wires are pulled through. This is done with the aid of a "fish" wire, a length of flexible wire, which can readily be pushed through the conduit. One



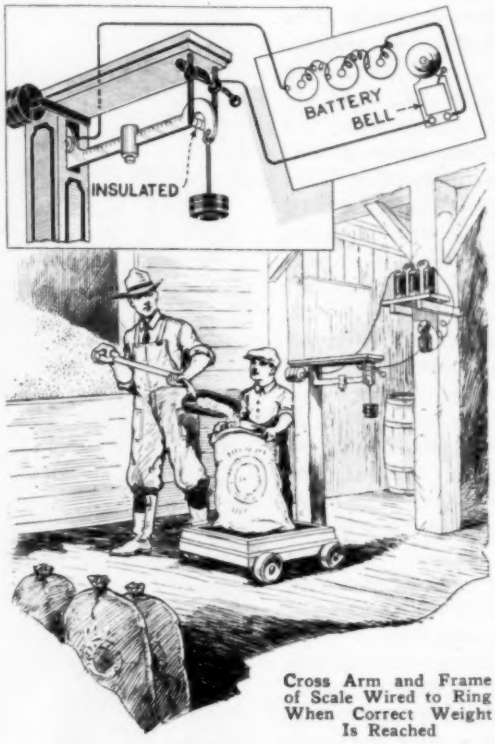
METHODS OF BENDING CONDUIT



end has a hook formed so that the bared ends of the wires can be attached and pulled through. Do not attempt to pull the wires through the conduit separately but pull them through together. It will be found, especially during hot weather, that the wires are apt to stick in the conduit. To reduce this friction to a minimum, dust soapstone on the wires, or if this is not available use ordinary flour.

Conduit usually comes in 10-ft. lengths, threaded at both ends. Do not attempt to fit a coupling between two 10-ft. lengths because it will be too hard to pull the wires through a 20-ft. length of conduit. Always screw in a special fitting with a removable cover of the types shown in Figs. 11, 12, 13 and 14. This enables the worker to pull the wire through the 10-ft. lengths separately and he can also tap off for other outlets by using a 4-outlet fitting shown in Fig. 11 or a 3-outlet fitting as shown in Fig. 12. Fig. 13 shows a fitting having a porcelain cover for a drop light, in cases of open-conduit work, and Fig. 14 shows an L-fitting. In Fig. 8 the worker has pulled the wire from the ceiling outlet to the L-fitting, where the conduit projects through the concrete wall, and he is pushing the wire through the horizontal length of conduit.

Fig. 9 shows a switchbox to which the conduit is screwed by means of two nuts as shown in the detail Fig. 10. A ceiling outlet, having a number of perforations, which can be easily punched out to accommodate the conduit on any side, is shown in Fig. 15. A neat conduit job in a farm workshop, equipped with a lighting plant is shown in Fig. 3.



Cross Arm and Frame of Scale Wired to Ring When Correct Weight Is Reached

Bell Alarm on Scales

When using scales to sack vegetables or grains to a uniform weight one may find he has not adequate light, as in a granary or cellar. It is a strain on the eyes to be watching the beam of the scales when nearing the predetermined weight. With a doorbell and a dry cell, wired as shown in the detail, an automatic alarm is made, which notifies the worker the moment the required weight is reached. Attach a length of bell wire to one post of the dry cell and to the iron crossbar above the weight end of the beam, another wire to the other terminal of the dry cell and to one post of the bell and a third wire from the other post of the bell to one of the bearings that support the beam of the scale. The iron crossbar below the weight end of the beam, on which the beam normally rests, must be insulated from the beam. A wrapping of paper or tire tape will serve this purpose. The sliding weight is set at the number of pounds desired in the sacks or crates. When the weight that the scales are set for is reached the beam will rise and make contact with the crossbar above and ring the bell. When the full sack or crate is removed the beam drops to the insulated crossbar and breaks the circuit.

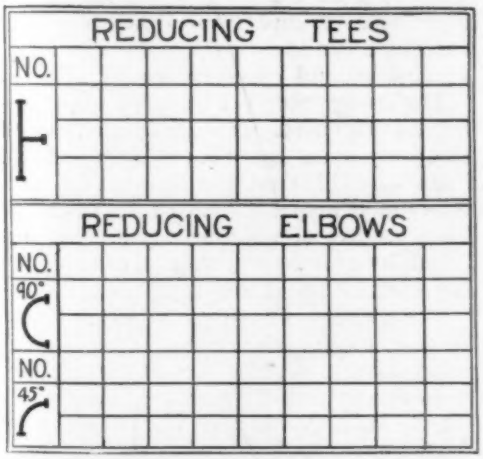
Test for Leaky Tire Valves

A common method of testing tire valves for leakage is to hold the stem in a can of water, with the wheel turned to bring the valve stem to the upper side. If the car is standing in a poorly lighted garage, or one

of the angle valves or disk wheels is being used, this is difficult to do. A better plan, in this case, is to turn the wheel until the valve is at the top, in the case of ordinary straight valves, put a few drops of water in the small valve cap and turn it back in place. Any air leakage past the small cap will be shown by a sputter that can be heard several feet away from the valve. Often the sound will be irregular. The air leaking past the valve inside builds up pressure until a defective valve cap will no longer hold it, when it escapes with a hiss. After the test has been made, remove the cap and shake out the water.

Record Form for Checking Pipe Fittings

Here is an ingenious and simple method of keeping a record of pipe fittings, which was developed in a large eastern engineering company's shop. Where reducing tees have three different sizes of openings, as often happens, the problem of recording these openings in an orderly manner was always more or less difficult. The accompanying reproduction of a blank used by this engineering concern shows how easily it can be done. Reducing el-



Blank Used by Engineering Company for Recording Pipe Fittings

bows and return bends can be checked or recorded on the same blank. The blank tells the whole story without the necessity of explanatory remarks such as are often found written on records pertaining to fittings of this character.

Countersinking Machine for Drilling Brake Lining

In a San Francisco auto-repair shop an old drill press has been used

Homemade Machine for Drilling and Countersinking Rivet Holes in Auto Brake Bands

in building a brake-lining countersinking machine at a saving of $85. The countersinking tool is put in the chuck and the guide arm is clamped in place on the drill table, the plate being operated by a foot lever, leaving both hands of the operator free to handle the work. In operation, the brake band is held over the guide and the lever pressed down, which lowers the drill. This drills and countersinks the lining in one operation. There is a shoulder on the tool, which prevents it from drilling too far. After drilling and countersinking, the rivets are placed in the holes and clinched by a foot-operated rivet machine.—C. W. Geiger, San Francisco, Calif.

Starting Gasoline Blowtorch

When starting a gasoline blowtorch, it is customary to place the hand over the nozzle to catch the fine stream of gasoline and direct it down to the generating pan. Of course, there will be gasoline left on the user's hands after doing this, and if a match is used to light the torch the gas on the hand may become ignited. The user must be careful to hold the match in the other hand while lighting the torch, or use a cork of the proper size in the nozzle of the torch to deflect the gasoline.

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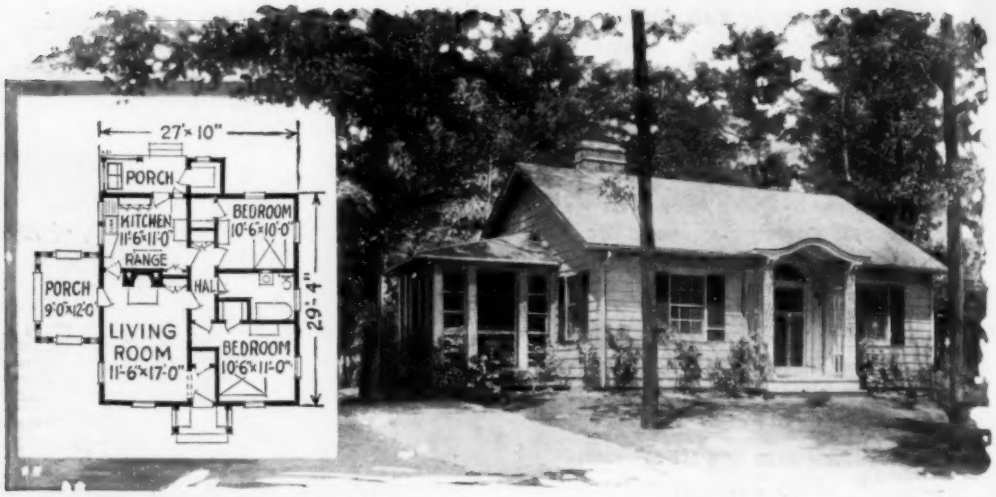
Is This Your Home?



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Plan No. 4A9

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and endorsed by the United States Chamber of Commerce. Inclose 10c and self-addressed envelope. Blueprints, specifications and material list for the house shown here may be obtained at nominal cost. Inclose self-addressed stamped envelope for reply. If further information is desired, send 5c and stamped envelope for a 24-page booklet explaining how the Small House Service Bureau functions and showing 12 sample plans. A new booklet, entitled "Fifty Ways to Lower Home Building Costs," illustrated by ten bureau houses actually lived in, and showing how as much as $1,000 can be saved on a home, may be obtained for 20 cents.

IN this delightful colonial bungalow, you have an excellent example of the theory that a small, inexpensive home can be as attractive and comfortable as a larger, more expensive dwelling. It has neither cellar nor second story. Louvers in the gables give the roof ventilation so that the rooms beneath can be kept cool in hot weather. The exterior is finished in wide siding on frame construction. All windows have double-hung sash and solid shutters. The entrance is through a graceful latticed porch on which side benches are attractive features.

Probably the most attractive feature of this plan is an open porch of generous dimensions placed at the side where it has privacy. This has particular advantage in that it offers an outdoor dining room since it is conveniently located with respect to the kitchen.

By a slight change in the plan, which would not increase the cost of the house, the porch could be shifted far enough to the rear to give it two doors, one opening into the kitchen and the other into the living room. It could then be inclosed with casement windows and converted into an all-year-around dining room.

The living room is a generously proportioned, attractively arranged room. A fireplace gives an opportunity to warm the house on chilly days and forms at the same time the principal feature of the room. It has a mantel of a simple and pleasing colonial design. At the right of the fireplace is a built-in bookcase.

The kitchen arrangement is excellent. The space for the refrigerator is provided with a door so that it can be iced from the outside. There is also a broom closet, built in back of the bookcase in the living room. The back porch has laundry tubs at one end and a good-sized storage room at the other. The lot size required would be 45 to 50 feet.

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